U. S. Government

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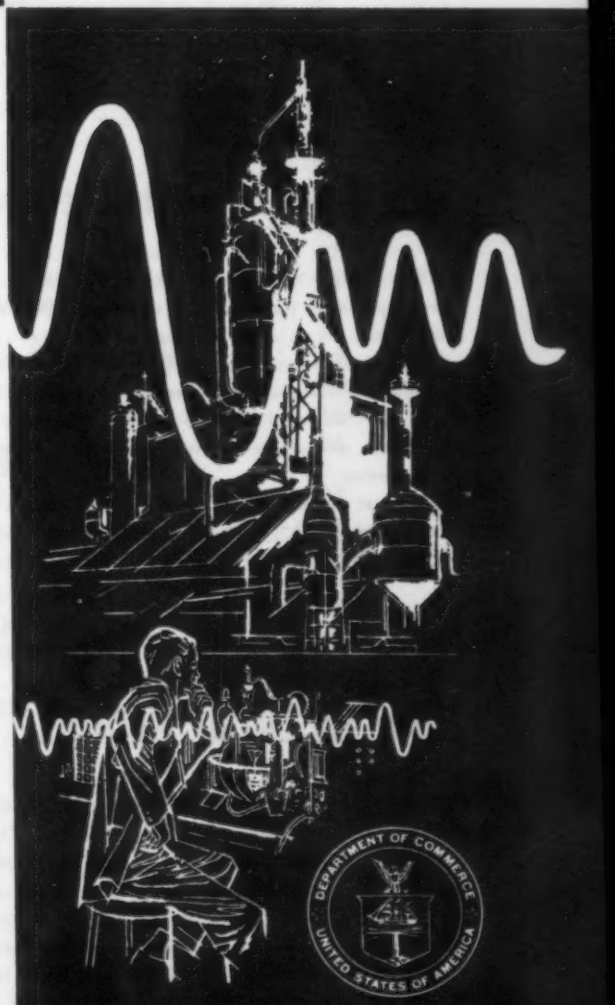

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-269 001 Div. 1
(TISTA/WAW) OTS price $1.75

Vertol Div., Boeing Co., Morton, Pa.
A STUDY TO CORRELATE FLIGHT MEASURED HELICOPTER VIBRATION DATA AND PILOT COMMENTS.
Rept. on Dynamic Problems in Flight Vehicles, by William J. Grant. Aug 61, 55p. incl. illus. 5 refs.
(Contract AF 33(616)5240, Proj. 1370)
(WADD TR 61-66) Unclassified report

DESCRIPTORS: (*Helicopters, *Vibration, Dynamics, Flight testing, Measurements.) (Pilots, Human engineering, Physiology.)

The results of a study aimed at improving the correlation between recorded helicopter vibration data and pilot comments are presented. Lissajous' patterns of resultant displacement, velocity, and acceleration are constructed and evaluated to define those characteristics which best correlate with the pertinent pilot comments. A new measure of comfort level, Equivalent Vibration Level (Veq) is defined. These quantities are calculated for all Lissajous' figures, and resultant acceleration is seen to be the most meaningful parameter. An improvement in the degree of correlation between measured vibration and pilot comment is shown through the use of Veq for the patterns of resultant acceleration, in lieu of the standard vibration criteria. (Author)

AD-269 060 Div. 1
(TISTA/VGW) OTS price $15.50

Naval Postgraduate School, Monterey, Calif.
SELF-ADAPTIVE CONTROL SYSTEMS. PART II, BLOCK DIAGRAM MODELS FOR THE AIRFRAME, AND SOME APPROACHES TO ACTIVE COMPENSATION,
by George J. Thaler, R. B. Borthwick, and R. E. McCamey. Oct 61, 231p. incl. illus. tables. (Technical rept. no. 20)
Unclassified report

DESCRIPTORS: (Jet planes, Airplanes, Aircraft, *Control systems, *Servo systems, *Automatic pilots, Mathematical analysis, Operational calculus, Determinants, Design.) (Airframes, Dynamics, Stability, Yaw, Pitch, Roll, Mathematical analysis.)

The second phase is reported of a long-range project to study self-adaptive control principles and apply them to the control of aircraft. The primary purpose of this phase is to develop a suitable mathematical model for the study of aircraft dynamics including all degrees of freedom, and the secondary purpose is to test the feasibility of using active compensators in the autopilot as a basis for self-adaptive schemes of control. The model is restricted to that of a rigid airframe, and is treated as a block diagram because of well established correlations between the block diagram and a determinantal array on one hand, and between the block diagram and analog simulation on the other hand. The initial model is held to a linear form since it is necessary that the model be reducible to simpler, well-known linear block diagram models when the proper restrictions are imposed. Analysis of a linear model is also readily obtained and provides a basis for estimating the importance of nonlinear effects which can be introduced by the injection of properly derived signals. This modification of the model can lead to simulation studies where an analytic treatment is impossible. (Author)

AD-269 152 Div. 1
(TISTA/WAW) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CALCULATING THE LOAD FLOOR OF AN AIRCRAFT (Raschet Gruzovogo Pola Samoleta),
by O. N. Korol'kov. 7 Dec 61, 14p. incl. illus. tables, 6 refs. (Trans. no. FTD-TT-61-204 of Izvestiya Vysshikh Uchebnykh Zavedeniy Aviatsionnaya Tekhnika 3:78-88, 1961)
Unclassified report

DESCRIPTORS: (Airframes, *Fuselages, Floors, Stresses, Design, Elasticity, Moments, Mathematical analysis, USSR.)

A method of calculating the load floor of an aircraft is discussed. Structurally the floor is made in form of a flat cover, consisting of plate and reinforcing beam assembly. The following conclusions were reached: (1) The elasticity of the fuselage does exert a considerable effect on the magnitude of bending moments of non-sandwiched longitudinal beams; (2) In some instances, when on account of fuselage elasticity there is a sharp rise in the calculated moments of the beams, it is more convenient to change into longitudinal sandwich beams; and (3) The approximate method of calculating floor cover with consideration of fuselage elasticity, suggested in the report, is simple and warrants sufficient accuracy for practical calculations. (Author)

AD-269 187 Div. 1
(TISTA/WAW) OTS price $2.75

Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SONIC FATIGUE RESISTANCE OF STRUCTURAL DESIGNS, Rept. for Feb 59-Mar 61 on Dynamics Problems in Flight Vehicles,
by Ira Dyer, Preston W. Smith, Jr. and others. Oct 61, 126p. incl. illus. tables, 41 refs.
(Contract AF 33(616)6340, Proj. 1370)
(ASD TR 61-262) Unclassified report

DESCRIPTORS: (*Airplane panels, Sandwich panels, Airframes, Riveted joints, Acoustics, Sound, *Noise, *Fatigue (Mechanics), Dynamics, Deformation, Stresses, Measurement, Mathematical analysis.)

Research on sound-induced fatigue of flight vehicle panels is described. Primary emphasis is placed on the problems of panel response and panel strain concentration; secondary emphasis is placed on the acquisition of fatigue data. Several panel designs were considered, including both idealized panels and panels of more practical design. Procedures for the improvement of sonic fatigue resistance, and for the testing of panels with siren sound sources, have been derived from the study. Theoretical and/or experimental studies are presented on linear response, angle-of-incidence effects, sandwich construction, strain concentrations in substructures, nonlinear response, fatigue of notched panels, and fatigue at rivet lines. (Author)

AD-269 208 Div. 1, 30
(TISTA/WAW) OTS price $1.50

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
FLIGHT VIBRATION SURVEY OF JRB-52B AIRCRAFT.
Rept. for July-Nov 56,
by Phyllis G. Bolds. July 61, 40p. incl. illus. tables.
(Proj. 1309)
(ASD TR 61-507) Unclassified report

DESCRIPTORS: (*Jet bombers, Jet planes, Vibration, Dynamics, Flight testing, Test methods, Test equipment.)

The JRB-52B aircraft was surveyed to determine the vibration environment existing throughout the vehicle under all flight conditions expected in service. Approximately 34,000 data points were obtained from 26 separate locations on the vehicle during 7 test flights. The data obtained were evaluated to determine the adequacy of vibration test requirements for long range bomber equipment contained in MIL-E-5272A. The data indicated that the vibration test requirements of that specification were satisfactory to simulate the actual environment existing on the JRB-52B aircraft. (Author)

AD-269 224 Div. 1
(TISTA/VGW) OTS price $8.10

General Dynamics/Convair, San Diego, Calif.
DEVELOPMENT OF A HIGH-TEMPERATURE, NUCLEAR-RADIATION-RESISTANT PNEUMATIC POWER SYSTEM FOR FLIGHT VEHICLES.
Quarterly rept., 25 Sep-24 Dec 61.
24 Dec 61, 82p. incl. illus. (Rept. no. ZR-1001-11)
(Contract AF 33(616)7582)
Unclassified report

DESCRIPTORS: (*Pneumatic systems, Resistance, Temperature, Thermal radiation, High temperature research, Radiation damage, Radiation effects.) (Aircraft equipment, Turbo-ramjets, Compressors, Rotary compressors, High pressure compressors, Compressed air, Pneumatic systems, Control systems, Hydraulic power systems, Design.) (*Pneumatic devices, Pneumatic valves, Pneumatic servomechanisms, High pressure valves, Check valves, Pressure regulators, Control valves.)

The development status of the rotary actuator and servo valve, pressure regulator, relief valve, accumulator, filter and check valve as well as the turbo-compressor are discussed. Progress was made on refining the test program for the tube fittings and boss seals. A high-temperature facilities survey was undertaken to evaluate instrumentation, procedures, and safety regulations used by other companies concerned with high-temperature and nuclear radiation testing. Results of this survey are also included. Initial preparations were undertaken to prepare the high temperature test laboratory for the test phase. Modification of the environmental chamber and air heater are underway. Instrumentation requirements were reviewed and preliminary procurement was initiated on long lead time test equipment. (Author)

AD-269 422 Div. 1, 12
(TISTA/WAW) OTS price $8.10

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
DEFLECTIONS AND STRESSES OF HEATED TRUSS TYPE STRUCTURES BY A DIRECT STIFFNESS METHOD.
Master's thesis,
by Ronald Joseph Meyette. Aug 61, 89p. incl. illus. tables, 6 refs. (Rept. no. GAE/Mech 61-13)
Unclassified report

DESCRIPTORS: (*Airframes, Structures, Aerodynamic heating, Load distribution, Deflection, Deformation, Stresses, Test methods, Mathematical analysis, Mathematical prediction.) *Theses.

The testing and stress analysis of pin-jointed truss type structures subjected to aerodynamic heating and loading are considered. Force-deflection relationships and corresponding member stresses were found by use of a direct stiffness method. Geometrical non-linearities and the variation with temperature of the modulus of elasticity and the coefficient of linear expansion were accounted for. Solutions obtained on a digital computer show little effect of geometric non-linearities on displacements. There is a more pronounced effect on member stresses but this was also small for the trusses examined. This method is a valuable tool for stress analysis and the force-deflection relationships obtained may be used to indicate incipient failure of a structure during testing. (Author)

AD-269 566 Div. 1, 15
(TISTP/MFA) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
OPTIMAL CONTROL IN BOUNDED PHASE SPACE,
by S. S. L. Chang. Aug 61, 36p. 6 refs. (Technical rept. no. 400-37)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-1238)
Unclassified report

DESCRIPTORS: (*Control systems, Control, Algebraic topology, *Functional analysis, Partial differential equations, Numerical analysis, Integration.) (Flight paths, Space flight, Equations of Motion.)

A bounded phase space condition is derived for

a restricted class of problems. The condition is proved to be a necessary condition for optimal control in a fixed time interval with free end point. If the system is linear, and the allowed regions of phase variables and controls are convex, the condition is both necessary and sufficient, for optimal control in a fixed time interval, as well as minimal time control between two fixed points. (Author)

AD-269 586 Div. 1, 9
(TISTA/WAW) OTS price $13.00

Vertol Div., Boeing Co., Morton, Pa.
HELICOPTER ROTOR HUB VIBRATORY FORCES SYSTEMATIC VARIATION OF FLEXIBLE ROTOR BLADE PARAMETERS.
Final rept.,
by V. Capurso, R. T. Yntema, and R. Gabel.
May 61, 180p. incl. illus. tables, 16 refs.
(Rept. no. R-244)
(Contract NOa(s) 60-6112-c)
Unclassified report

DESCRIPTORS: (*Helicopter rotors, Vibration, Reduction, Mathematical analysis.) (Helicopter blades, Design.)

A study was made of the effect on vibratory hub loads of systematic variations in blade mass, planform, twist distribution, flap and chord bending stiffness, pitch control stiffness, pitch axis - chordwise center of gravity axis - aerodynamic center axis locations, lag damper and lag spring rates. The variations are made with respect to the standard blade of a typical single rotor helicopter having a gross weight of 8000 lbs. The results are based on an Associated Matrix flexible blade analysis using classical linearized blade element aerodynamic theory for the first four harmonic airloadings; uniform inflow is assumed and the effects of compressibility and stall are neglected. Results indicate that there are some parameter selections which reduce both vertical and horizontal loads, others which reduce one and increase the other, and some which increase both. The results can therefore be used to select optimum parameter trends for given helicopter applications wherein longitudinal and vertical hub loads may be inducing compensatory response amplitudes. (Author)

AD-269 715 Div. 1, 12
(TISTA/VGW) OTS price $1.50

Flight Control Lab., Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
COCKPIT CONTROL-DISPLAY SUBSYSTEM ENGINEERING,
by John H. Kearns and Malcolm L. Ritchie.
Oct 61, 41p. incl. illus. 3 refs.
(In cooperation with Richie and Associates, Dayton, Ohio)
(ASD TR 61-545) Unclassified report

DESCRIPTORS: (Design of Cockpits, *Flight instruments, Control panels, *Instrument panels, Display systems for Aircraft, Space capsules, Manned, Satellite vehicles.)

Cockpit control-display subsystems enable the human operators to provide their required control inputs to weapon systems accurately and at the right time. These subsystems must be designed as an integral part of the total systems. This report presents the control-display schedule as a sequence of design activities. The relationships between activities within control-display design and the rest of the system are shown. (Author)

AD-269 814 Div. 1
(TISTA/VGW) OTS price $1.60

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE.
Interim rept. no. 19, 1-31 Dec 61,
by C. V. Lassmann. 8 Jan 62, 5p. incl. illus. tables. (Engineering rept. no. 4301)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: (Fuel systems, *Fuel hose, Towed bodies for *Refueling in flight, Design.)

Development of the Beech Model air refueling hose has continued with satisfactory progress in all areas except correction of previously reported clutch deficiencies during this interim period. The first prototype is complete to the extent possible without satisfactory clutches. The second unit is ready for static test and the third unit is progressing satisfactorily. The first unit is now thirteen days behind schedule due to the current clutch problems. No other major problems have been encountered. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-269 035 Div. 2, 30
(TISTP/MFA) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
A NUMERICAL METHOD FOR COMPUTING RADIATIVE TEMPERATURE CHANGES NEAR THE EARTH'S SURFACE,
by William P. Elliott and Donald W. Stevens.
Sep 61, 21p. incl. illus. table, 12 refs.
(GRD Research notes no. 69; AFCRL-869)
(Proj. 7655)
Unclassified report

DESCRIPTORS: (Numerical analysis, *Infrared radiation, Earth, Surface properties.) (Temperature, Atmosphere, *Climate, Water vapor, Specific heat, Air, Density, Fog.) (Digital computers, Programming, Partial differential equations.)

A method of computing the temperature changes due to infrared radiation flux divergence is presented. The method is based upon a tabular scheme developed by D. L. Brooks (J. Meteor. 7:313-321, 1950). Application of the method to actual data shows that the radiative temperature changes can exceed the observed temperature changes at night. The radiative temperature changes decrease with elevation and become 1 - 2 degrees per day at about 100 meters. Several applications of the method in boundary layer studies are also indicated. (Author)

Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-269 040 Div. 2, 30
(TISTA/VGW) OTS price $4.60

Geophysics Corp. of America, Bedford, Mass.
INSTRUMENTATION FOR THE DETERMINATION OF THE COMPOSITION OF THE UPPER ATMOSPHERE.
Technical progress rept. 15 Mar-15 June 61, by R. F. Herzog. 15 June 61, 42p. incl. illus. tables.
(Contract NAS5-270)
Unclassified report

DESCRIPTORS: (*Geophysics, Sounding rockets, Mass spectrometers, Instrumentation, Design, Tests for *Mass spectroscopy of Oxygen, Helium in Atmosphere, *Upper atmosphere, Spectrographic analysis.) (Ionization gages, Pressure gages, Manometers, Calibration, Tests.) (Atmosphere models, Analysis.)

The rocket-borne helium mass spectrometer testing was begun to find the optimum operating characteristics of the system. The main emphasis in the survey of literature dealing with helium in the atmosphere was focused on papers from the USSR. Helium partial pressure profiles were calculated for different assumptions about the height of the mictopause. The atomic species calibration system was tested in the laboratory and modifications based on these operations have been initiated in order to produce a better over-all system. The original of the GCA cold cathode ionization gauge was operated in the laboratory and a new, all fusion welded, metal-ceramic gauge was designed and assembled for testing. The vacuum gauge calibration system was used to calibrate ionization gauges as a secondary pressure standard. A revision of the 1959 ARDC Standard Atmosphere was issued during the past period by COESA. This revision was a result of an intensive survey of recent atmospheric research literature; the basis for this revision is discussed. (Author)

AD-269 041 Div. 2, 30
(TISTA/VGW) OTS price $6.60

Geophysics Corp. of America, Bedford, Mass.
INSTRUMENTATION FOR THE DETERMINATION OF THE COMPOSITION OF THE UPPER ATMOSPHERE.
Technical progress rept. 22 Oct 60-15 Mar 61. 15 Mar 61, 61p. incl. illus.
(Contract NAS5-270)
Unclassified report

DESCRIPTORS: (Geophysics, Instrumentation, Design, Tests.) (*Mass spectrometers for Sounding rockets, Mass spectroscopy of *Upper atmosphere, Atmosphere, Helium, Oxygen, Nitrogen, Spectrographic analysis.) (Ionization gages, Pressure gages, Manometers, Calibration, Tests.) (Atmosphere models, Analysis.)

The rocket-borne version of the mass spectrometer to be used for helium measurement was designed, fabricated, assembled, and is being tested. The system that will be used to calibrate mass spectrometers for atomic oxygen and nitrogen was completed. Testing of the system components and operation is being conducted. The time-of-flight mass spectrometer remained at the Bendix Research Laboratories, but a new pumping system for the instrument was installed on a test console. The ceramic ring design cold cathode ionization gauge was completed and calibrated. The vacuum gauge calibration system was in operation. Pressure readings of the McLeod gauge pressure standards were compared, and the difference in their readings was traced to a systematic error in determining the final pressure of the compressed gas in the closed end capillary. (Author)

AD-269 122 Div. 2
(TISTP/FR) OTS price $4.60

Institute of Tech., St. Louis U., Mo.
S WAVE STUDIES OF EARTHQUAKES OF THE NORTH PACIFIC. PART I: KAMCHATKA,
by William Stauder. 7 Dec 61, 18p. illus. tables, 15 refs. (Scientific rept. no. 1)
(Contract AF 19(604)8054, Proj. 8652)
(AFCRL-1086, pt. 1) Unclassified report

DESCRIPTORS: (Earthquakes, *USSR.) (*Seismic waves, *Polarization, *Distribution, Seismic stations, Statistical analysis, Azimuth, Map projection.)

The polarization of S waves at stations distributed azimuthally about the source was examined for each of 23 Kamchatka earthquakes of 1950-1960. In 19 of these earthquakes the P and S wave data were in agreement with a double couple source as the point model of the focal mechanism. The S waves indicate a uniform mechanism which repeats itself from earthquake to earthquake and from which it may be inferred that the axes of greatest and least stress at the foci tend to lie in a vertical plane normal to the trend of the Kamchatka-Kuriles arc. The axis of least stress usually plunges almost vertically under the continent, but may also plunge less steeply, at angles as low as 45 degrees. At least two earthquakes may be represented by a single couple source. (Author)

AD-269 126 Div. 2, 30, 25
(TISTA/SEB) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
STUDY OF CRATER PHYSICS.
Final rept., 19 Dec 60-19 July 61, 19p. illus. 8 refs. (Rept. no. 8980-0003-RU-000)
(Subcontract to Thompson Ramo Wooldridge, Inc., Contract NAS 5-763)
Unclassified report

DESCRIPTORS: (*Meteorites, *Cratering, Dynamics, Detection, Measurement, Theory, Tests.) (Detectors, Acoustic detectors, Thin films.) (Particles, Ionization, Energy, Velocity.) (Test methods, Test equipment.)

The work performed on the calibration and study of various meteorite detectors is reviewed. Dynamic measurements are reported for detectors designed to utilize impact flash, impact ionization, and momentum transfer effects; microphone detectors used to study the production of a signal particle impact are also reviewed.

AD-269 186 Div. 2, 8
(TISTP/TL) OTS price $13.00

Boeing Scientific Research Labs., Seattle, Wash.
SYNCHROTRON RADIATION AS THE SOURCE OF THE POLARIZED DECIMETER RADIATION FROM JUPITER.
Doctoral thesis,
by David B. J. Chang. 1962, 186p. incl. illus. tables, 104 refs. (Rept. no. D1-82-0129)
Unclassified report

DESCRIPTORS: (*Jupiter, Mars, Synchrotrons, Polarization, Electromagnetic waves, Cosmic rays, Radio astronomy, *Extraterrestrial radio waves, Plasma physics.) (Particles, Terrestrial magnetism, Optics, Galaxies, Nebulae, Atmospheric electricity, Magnetic storms, Magnetohydrodynamics, Planets, Super high frequency, Ultra high frequency.) (Van Allen radiation belt, Solar energy, Gases ionization, High temperature research, Ionosphere, Maser.) (Geometry, Differential equations, Diffraction gratings, Magneto-optic rotation, Difference equation, Bessel functions.) (Electrons, Protons, Relativity theory.)

A Stokes parameter description is developed for synchrotron radiation from a group of ultrarelativistic electrons with any specified distribution of positions, energies and directions of motion. This description is used to study the radiation from a shell of ultrarelativistic electrons trapped in a dipole field. It is found that the polarization observed for the 31-cm radiation from Jupiter could be obtained from such shells provided a large number of the electrons have relatively flat helices. (Author)

AD-269 222 Div. 2
(TISTP/FR) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
AN EXAMPLE OF CHROMOSPHERIC STRIATION OBSCURATION BY A GREAT FLARE,
by Henry J. Smith and William D. Booton. Aug 61, 12p. incl. illus. 15 refs. (GRD Research notes no. 68; AFCRL-834)
Unclassified report

DESCRIPTORS: (*Solar atmosphere, Solar disturbances, Interference, *Solar flares, Vortices, Magnetic fields.)

Certain great solar flares produce a temporary obscuration or disruption of the neighboring chromospheric striation patterns. These patterns are basically hydrodynamic phenomena, but are closely linked to the local magnetic field. Hence their behaviour is important to an understanding of the physical processes in flares. Seventeen great flares on Sacramento Peak films were examined for this effect. One outstanding example was found on 6 May 1960; this case is described in detail. Evidence clearly shows that the effect results from local obscuration by flare surge material in the corona; it is not necessary to invoke any catastrophic change in the magnetic field. (Author)

AD-269 267 Div. 2, 32
(TISTP/FR) OTS price $6.60

Pacific Science Board, National Research Council, Washington, D. C.
ATOLL RESEARCH BULLETIN NO. 85.
31 Dec 61, 60p. incl. illus. tables.
(Contract N7onr-230012)
Unclassified report

DESCRIPTORS: (Pacific Islands, Maps.) (*Melanesia, *Micronesia, *Polynesia.) Sociology.

Since land tenure problems are of magnitude and are ubiquitous, it was felt that comparative studies from several parts of the Pacific might be useful. Westernized areas such as Hawaii, New Zealand, and Australia were excluded from consideration, and an attempt was made to obtain contributions from the Gilbert and Marshall Islands in Micronesia, from the Solomon and Fiji Islands in Melanesia, and from the Cook Islands in Polynesia. (Author)

AD-269 268 Div. 2
(TISTP/FR) OTS price $9.10

Pacific Science Board, National Research Council, Washington, D. C.
ATOLL RESEARCH BULLETIN NOS. 76-84.
1 Dec 61, 1v. incl. illus. refs.
(Contract N7onr-230012)
Unclassified report

DESCRIPTORS: (*Pacific Islands, Micronesia, Hawaii.) (Plants, Soils, *Coral reefs, Animals, Rock, Climate, Algae.)

Contents:
Observations on Puluwat and Gaferut, Caroline Islands, by William A. Niering
Historical and climatic information on Gaferut Island, by Marie-Helene Sachet
A check list of marine algae from Ifaluk Atoll, Caroline Islands, by Isabella A. Abbott
Narrative report of botanical field work on Kure Island, 3 October 1959 to 9 October 1959, by Horace F. Clay
Botanical observations on Leeward Hawaiian Atolls, by Charles H. Lamoureux
The tropical coral reef as a biotope, by Sebastian A. Gerlach
Qualitative description of the coral atoll ecosystem, by F. R. Fosberg
Heron Island, Capricorn Group, Australia, by F. R. Fosberg, R. F. Thorne, and J. N. Moulton
Notes on some of the Seychelles Islands, Indian Ocean, by C. J. Piggott

AD-269 342 Div. 2, 30, 15
(TISTP/FR) OTS price $3.60

Armour Research Foundation, Chicago, Ill.
STUDY OF METEOROLOGICAL SURVEILLANCE OBSERVING SYSTEM.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 60, by E. Uretz. 31 Mar 60, 33p. incl. illus. 17 refs. (Rept. ARF 5125-1)
(Contract DA 36-039-sc-80328)
Unclassified report

DESCRIPTORS: (Meteorology, *Meteorological data.) (*Meteorological instruments, Wind-direction indicators, Acoustics, Meteorological radar, Infrared equipment, Radiation instruments, Microwave equipment, Radar equipment.) (Atmosphere, Temperature, Wind, Humidity.) (Integral transforms, Integral equations.) *Micrometeorology.

The methods being analyzed were classified according to the energy used. A technique for measurement of air temperature and water vapor content by utilizing microwave energy emitted by CO2 and O2 is discussed. A technique for measurement of air temperature by utilizing infrared energy is proposed. Various schemes for measuring wind velocity are discussed. A technique for reducing integrated temperature and H2O vapor data to local data is discussed.

AD-269 369 Div. 2, 13
(TISTP/FR) OTS price $9.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
MIXING AND DISPERSIVE ACTION OF WIND WAVES,
by F. D. Masch. Nov 61, 106p. incl. illus. tables, 45 refs. (Series no. 138, Issue no. 6)
(U. S. Public Health Grant RG 5445)
Unclassified report

DESCRIPTORS: (*Water waves, *Wind, Jet mixing flow, Transport properties, Sewage, Diffusion, Particles, Distribution, Equations.) (Hydraulic models, Water tanks, Tests.)

The mixing and dispersive action of wind induced water waves was studied in a laboratory flume at different water depths, wind speeds, and wave conditions. Measurements of the shape of the dispersion plume were made, and the effects of wave characteristics on the lateral diffusion coefficient were noted. (Author)

AD-269 370 Div. 2
(TISTP/FR) OTS price $2.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
OBSERVATIONS ON VERTICAL MIXING IN A CLOSED WIND WAVE SYSTEM,
by Frank D. Masch. Jan 62, 15p. illus. 13 refs. (Series no. 138, Issue no. 7)
(U.S. Public Health Grant RG 5445)
Unclassified report

DESCRIPTORS: (*Water waves, *Wind, *Jet mixing flow, Transport properties, Particles, Distribution, Equations, Water tanks, Tests.) (*Sewage, Diffusion, Oceans.)

The results of this investigation indicated that vertical mixing was a result of both the wind-induced drift current and the turbulent wave motion. The dispersion patterns at various stations downwind of the source could be approximated by one-half of a normal error curve and the thickness of a mixing layer defined in terms of a standard deviation. For each wind speed and water depth, the standard deviation was independent of distance from the source. Although the relative magnitude of the vertical transport due to wave action was unknown, the thickness of this mixing layer seemed to be controlled by the waves rather than by water depth. A possible explanation for the mixing effect of the waves is discussed. (Author)

AD-269 405 Div. 2, 33
(TISTP/FR) OTS price $6.60

Air Force Cambridge Research Labs., Bedford, Mass.
EVALUATION OF ARCTIC ICE-FREE LAND SITES KRONPRINS CHRISTIAN LAND AND PEARY LAND, NORTH GREENLAND 1960,
by William E. Davies and Daniel B. Krinsley. June 61, 51p. incl. illus. tables (Air Force Surveys in Geophysics no. 135; AFCRL-469)
(Proj. 7628)
Unclassified report

DESCRIPTORS: (*Landing fields, *Greenland, Construction, Geophysics, Terrain, Climatic factors.) (Greenland, Meteorological data.) (Greenland, Air drop operations.)

A report is given of terrain investigations conducted in North Greenland, in June and July 1960, to locate potential airfield sites. Eight sites were studied; all require a small amount of grading to make a 5000-ft (1500-m) runway. In addition the Broenlund Fjord airfield, site of a test landing on a natural surface in 1957, was re-examined and the east half of the runway was found unusable at the time of visit because of late snow melt and poor drainage. Scientific observations showed that northern Peary Land was covered only by valley glaciers during the last glacial period and that an extensive marine invasion which deposited marine and related lacustrine silt occurred when the ice retreated about 6000 years ago. This was followed by a readvance of glaciers down major fjords and subsequent retreat to present ice fronts. (Author)

AD-269 486 Div. 2
(TISTP/MFA) OTS price $6.60

Army Map Service, Washington, D. C.
THE POSITIONAL ACCURACY OF MAPS,
by Andrew M. Glusic. Mar 61, 63p. incl. tables, 21 refs. (Technical rept. no. 35)
(Proj. no. MO-011)
Unclassified report

DESCRIPTORS: (*Numerical analysis, Errors, *Terrain, *Maps, *Position finding, Aerial photographs.) (Aerial photography, Mapping, Military intelligence.)

In the positional evaluation of foreign maps, the scaled positions of horizontal control are compared with available coordinates, and from the differences the root-mean-square error of scaled positions is computed. (Author)

AD-269 491 Div. 2
(TISTP/FR) OTS price $6.60

Air Weather Service, Scott Air Force Base, Ill.
CLIMATIC ASPECTS OF BALLISTIC WIND AND DENSITY,
by William C. Spreen, Rolf M. Nilsestuen and Oscar E. Richard. Nov 61, 60p. incl. illus. tables, 13 refs. (Technical rept. no. 161)
Unclassified report

DESCRIPTORS: (*Wind, High altitude, Periodic variations, Velocity, Direction finding, Density, Atmosphere models, *Statistical analysis, Vector analysis.) (Climatic factors, Guided missile trajectories.)

The climatological behavior of the ballistic wind and density is examined using the means of equally weighted values of upper-air wind and density at altitudes 2 km apart. These mean values are termed integrated wind and density, respectively. Three integrated values of wind and density are used, one for the atmosphere below 12 km, another for the atmosphere below 16 km, and one for the zone below 24 km. Data from 25 stations in the Northern Hemisphere, chosen from widely diverse climatic regimes, are employed. The specific aspects of behavior examined are: the effects of variability on short-period means; comparison of monthly and seasonal statistics; the effects of restricted amounts of data; and the relation between integrated density and integrated wind. (Author)

AD-269 497 Div. 2
(TISTP/MS) OTS price $1.60

Geophysical Inst., U. of Alaska, College.
BIBLIOGRAPHY OF PUBLICATIONS. SUPPLEMENT I.
Dec 61, 9p. 67 refs.
Unclassified report

DESCRIPTORS: (*Geophysics, *Alaska, Geophysical prospecting, Earthquakes, *Bibliography.)

AD-269 498 Div. 2
(TISTP/FR) OTS price $1.60

Geophysical Inst., U. of Alaska, College.
HIGH LATITUDE GEOPHYSICAL DATA FOR AUGUST-SEPTEMBER 1961.
1 Nov 61, 12p. incl. tables (Rept. no. UAG-C 24)
Unclassified report

DESCRIPTORS: (*Geophysics, *Data, Tables, Alaska.) (Earth, Electric currents, *Terrestrial magnetism, Noise (Radio), Solar noise, Extraterrestrial radio waves, Absorption by Ionosphere, Aurorae, Radar echo areas, Diurnal variations, Periodic variations, Tables.)

AD-269 502 Div. 2, 8
(TISTP/WH) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE EFFECT OF MISMATCHING IN THE MEASUREMENT OF THE AIR-EARTH CURRENT-DENSITY,
by Lothar H. Ruhnke. Oct 61, 13p. incl. illus. 7 refs. (ASRDL Technical rept. no. 2232)
Unclassifiedreport

DESCRIPTORS: (*Atmospheric electricity, Measurement, Errors, Mathematical analysis, Differential equations, Functions.) (Atmospheric electricity, Measurement, Instrumentation, *Electrical networks.)

Errors are analyzed which arise when using Kasemir's method to measure air-earth current-density. Step function, ramp function, and periodic functions in the current as well as in the time-constant theta of the air are discussed. (Author)

AD-269 515 Div. 2
(TISTP/FR) OTS price $5.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
A GENERAL RECONNAISSANCE OF COASTAL DUNES OF CALIFORNIA,
by R. P. Zeller. Aug 61, 37p. illus. 39 refs. (Series 72, Issue no. 6)
(Contract DA-49-055-eng-17)
Unclassified report

DESCRIPTORS: (Geology, *Beaches, California.) (*Sand, Sedimentation, Deposits, Wind, Water waves.)

AD-269 540 Div. 2, 25
(TISTP/GRW) OTS price $12.50

California U., Los Angeles.
NON-GEOSTROPHIC THEORY OF ATMOSPHERIC WAVES. Final rept.,
by Jorgen Holmboe. Apr 61, 347p. incl. illus. tables.
(Contract AF 19(604)3064)
(AFCRL-689) Unclassified report

DESCRIPTORS: (*Atmosphere models, Wave transmission, *Harmonic analysis, Mathematical analysis.) (Atmosphere, *Cyclones, *Dynamics.)

The symmetric wave theory is applied to a two-isentropic-layer model of the atmosphere. The non-rotating two-layer model is used to examine the justification for the quasi-solenoidal approximation and the vertical quasi-symmetry approximation which is introduced in the subsequent theory. The non-geostrophic theory is discussed for symmetric waves in an atmosphere with constant rotation (zero planetary vorticity gradient). The physical interpretation of the behavior of the waves is emphasized. (Author)

AD-269 544 Div. 2
(TISTA/VGW) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
STRATOSPHERIC TEMPERATURES RELATED WITH SOLAR ACTIVITY,
Master's thesis,
by Loyd Clinton Garvin. Aug 61, 52p. incl. illus. tables, 12 refs. (Rept. no. GA/Phys/61-1)
Unclassified report

DESCRIPTORS: (Radiosondes, Meteorological data, *Stratosphere, Temperature, Terrestrial magnetism, Air mass analysis, Solar energy, Solar flares, Solar disturbances, Sunspots, Statistical analysis.) *Theses.

A study is reported of the relationship between stratospheric temperatures and variations in solar activity. Monthly mean 50 mb. temperatures and departures from the mean were determined for selected stations and statistically compared against sunspot and geomagnetic disturbance departures from the mean. Data were divided into summer and winter periods and into three latitudinal regions to determine seasonal and latitudinal variations. One hundred, 50, and 30 mb. temperatures and 1000 and 30 mb heights over San Juan were compared against the numbers of sunspots. Results indicate that stratospheric temperatures are better related with sunspot numbers than with geomagnetic indicator Ci. Results also indicate a better relationship in low latitudes, a better relationship in summer, with increasing height. It is concluded that increased electromagnetic radiation associated with sunspots increases stratospheric temperatures and high atmospheric densities. (Author)

AD-269 597 Div. 2
(TISTP/FR) OTS price $6.60

Naval Air Station, Norfolk, Va.
METEOROLOGICAL WIND-SCALES,
by Charles A. Palmer, 28 Sep 61, 61p. incl. illus.
(Proj. NWRF 34-061-048)
Unclassified report

DESCRIPTORS: (*Computers for *Wind from Nomographs, Meteorological charts.) (Naval operations, Climatic factors.)

Wind scales designed for use in the analysis of all types of meteorological plotting maps used by the Naval Weather Service, both for the surface and the upper air, are presented. Also presented is a discussion of geostrophic and gradient winds, and of various types of wind scales. Although none of the wind scales discussed or provided are new in concept, the Universal-Geostrophic-Gradient-Shear-Wind Computer and the Constant Geostrophic Acceleration Scale are not widely known. (Author)

AD-269 598 Div. 2, 25
(TISTP/FR) OTS price $5.60

New York U. Coll. of Engineering, N. Y.
A NUMERICAL EXPERIMENT ON MODELLING THE BEHAVIOR OF FOG AND STRATUS.
Final rept.,
by Edwin L. Fisher. Oct 61, 49p. incl. illus. table, 16 refs.
(Contract AF 19(604)6651, Proj. 8641)
(AFCRL-1050) Unclassified report

DESCRIPTORS: (*Fog, *Stratus clouds, Weather forecasting, *Atmosphere models.) (Air, Temperature, Water vapor, Water, Mathematical analysis.)

The feasibility of designing a dynamical model for forecasting, the development of fog and stratus was studied. To this end, several simple models based on numerical solutions of the diffusion equation were constructed and solved, and the resulting predictions were examined with two major points in mind. The first point deals with the feasibility of achieving any degree of success with this type of model. The second point deals with the type of observational data which would be needed for it, and the time and space scales on which the observations would have to be made. (Author)

AD-269 601 Div. 2
(TISTP/FR) OTS price $3.60

Naval Air Station, Norfolk, Va.
STATISTICS OF CYCLONIC ACTIVITY IN THE WESTERN MEDITERRANEAN,
by Charles A. Palmer, Jr. 28 Sep 61, 32p. incl. illus. tables.
(Proj. no. NWRF 13-0961-049)
Unclassified report

DESCRIPTORS: (*Cyclones, *Mediterranean Sea, Statistical analysis.) (Naval operations, Climatic factors.)

AD-269 621 Div. 2, 5
(TISTP/WH) OTS price $13.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INVESTIGATIONS OF INHOMOGENEITIES IN THE IONOSPHERE (Issledovaniya Neodnorodnostey V Ionosfere).
Aug 61, 188p. incl. illus. tables, 6 refs.
(Trans. no. MCL-1044/1, no. 4, 97p., 1960)
Unclassified report

DESCRIPTORS: (*Radio waves, Propagation, *Ionosphere.) (*Ionosphere models, *Correlation techniques, Statistical analysis, *Statistical functions, Ionospheric disturbances.) USSR.

Nine articles devoted to the study of the properties of inhomogeneities in the ionosphere ranging in dimensions from tens of meters to hundreds of kilometers are presented. The development of the three-point correlation analysis method is discussed, whereby two-dimensional analysis is developed for a case of three measurements. A method is described and results are given of investigations from 1957-1959 on the properties of large ionospheric inhomogeneities within the space of three measurements by combining space-diversity and frequency-separation reception. The properties of small inhomogeneities are investigated using the correlation method, and the results obtained by the method of similarity and by the correlation method are compared. The movement of disturbances embracing extensive area of the ionosphere is given. The polarization of radio waves and its influence on the methods of observing ionospheric inhomogeneities is investigated. The use of the correlation method is considered in the study of the properties of ionospheric inhomogeneities. The results of the investigations of ionospheric drifts for new points (Irkutsk, Rostov), at which considerable material was collected during the IGY are given. (Author)

AD-269 622 Div. 2
(TISTA/VGW) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE UPPER ATMOSPHERE AND INTERPLANETARY MEDIUM,
by V. G. Kurt. 7 Aug 61, 23p. (Trans. no. MCL-1047/1 of Prioda 2:23-30, 1961)
Unclassified report

DESCRIPTORS: (*Astrophysics, Atmosphere models, *Upper atmosphere, Planetary atmospheres, Atmosphere, Ionosphere, Exosphere, Electrical corona, Atmospherics, Interstellar matter, Electrons, Ions, Density, Atmospheric sounding, Manometers, Sounding rockets, Satellite vehicles, USSR.)

AD-269 636 Div. 2, 20
(TISTP/WH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
TRANSMITTANCE OF THIN ATMOSPHERIC LAYERS IN THE 1-13 MICRON RANGE,
by V. Ye. Zuyev, M. Ye. Elyashberg, and G. A. Safonova. 17 Aug 61, 10p. incl. illus. table, 3 refs. (Trans. no. MCL-1217/1 of Izvestiya Vysshikh Uchebnykh Savedeniy, Fizika 5:77-81, 1960)
Unclassified report

DESCRIPTORS: (*Infrared radiation, Attenuation, *Atmosphere, Mathematical analysis, Numerical analysis, Functions.) (*Infrared radiation, Absorption, *Water vapor, Spectrographic analysis, Spectrographic data.) USSR.

The problem of the applicability of the exponential law and the square-root law to describe the attenuation of infrared radiation is considered for layers of water (1/10,000) to (1/100) cm thick. Quantitative data are obtained for the spectral and integral transmittance of thin atmospheric layers (up to 3 m) in the 1-13 micron range. (Author)

AD-269 672 Div. 2, 30, 6
(TISTP/FR) OTS price $10.10

Oregon State U., Corvallis.
INVESTIGATION OF INSTRUMENTATION AND TECHNIQUES FOR ARMY WEATHER OBSERVATION.
Final technical rept., 1 Feb-30 Apr 61,
by Fred W. Decker, Herbert Kershaw, Jr., and Laurence D. Mendenhall. 30 Apr 61, 123p. incl. illus. 133 refs.
(Contract DA 36-039-sc-78918, Proj. 3A99-27-005-04)

Unclassified report

DESCRIPTORS: (*Meteorological radar, Meteorological data.) (Army operations, Weather forecasting, Radar echo areas, Meteorological radar.)

During the past two years, the presence of a Weather Radar Set AN/CPS-9 made possible a program of observation of weather phenomena from peaks of the Oregon Coast Range near Corvallis. The results of the program and some positive recommendations based upon the experience and study made possible with this equipment are presented. (Author)

AD-269 675 Div. 2
(TISTA/VGW) OTS price $6.60

4th Weather Group, Eglin Air Force Base, Fla.
METEOROLOGICAL SUPPORT FOR BALLOON OPERATIONS.
1 Jan 62, 63p. incl. illus. tables (4WGP Pamphlet no. 105-11-1)

Unclassified report

DESCRIPTORS: (*Meteorological balloons, Flight paths, Meteorological data, Military requirements, Stratosphere, Weather forecasting, Mathematical prediction, Tables.)

Safety and international considerations have led the Air Force to recognize the need for predetermined trajectories to program balloon operations for periods when weather conditions exceed certain specified minimums. This pamphlet presents a description of balloon operations and stratospheric forecasting techniques as they have evolved at Vernalis, California. It should assist those meteorologists who require familiarization in the complex art of balloon trajectory forecasting. (Author)

AD-269 713 Div. 2, 25
(TISTP/FR) OTS price $2.60

RAND Corp., Santa Monica, Calif.
THE EFFECT OF SURFACE TEMPERATURE VARIATIONS ON THE POLAR NIGHT JET,
by C. Leovy. Dec 61, 21p. incl. illus. table, 9 refs. (Rept. no. RM-2951-PR)
(Contract AF 49(638)700, Proj. RAND)

Unclassified report

DESCRIPTORS: (Stratosphere, *Jet streams, Ozone, Heating.) (Atmosphere models, Perturbation theory, Partial differential equations, Integral transforms.)

The possibility of differential heating in the ozone layer due to differences in ground and lower troposphere temperatures as a mechanism for producing the observed stationary perturbations of the polar night jet was examined. It is found that this mechanism is not likely to be the cause of the disturbances. (Author)

AD-269 768 Div. 2
(TISTP/FR) OTS price $14.50

Fish and Wildlife Service, Washington, D. C.
WATER TEMPERATURES OFF THE SOUTH ATLANTIC COAST OF THE UNITED STATES. THEODORE N. GILL CRUISES 1-9, 1953-54.
Special scientific rept.,
by William W. Anderson, Joseph E. Moore, and Herbert R. Gordy. May 61, 206p. incl. illus. tables (Fisheries no. 380)

Unclassified report

DESCRIPTORS: (Atlantic Ocean, *Gulf Stream, Underwater, *Temperature, Tables, Maps.)

A general survey of those waters adjacent to our coast in the region from Cape Hatteras on the north to the Florida Straits on the south was conducted in 1953 and 1954. Water temperature data obtained are processed and organized in a usable and readily available form. Surface water temperatures by season are presented graphically. (Author)

AD-269 787 Div. 2, 32
(TISTP/FR) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
CAVES IN SOUTHEASTERN TURKMENISTAN AND IN THE IRKUTSKAYA OBLAST.
6 Dec 61, 2p. incl. illus. (AID rept. 61-163 of Ancient Dwelling Caves of the Takhta-Bazarskiy Rayon; Vsesoyuznoye Geograficheskoye Obshchestvo. Izvestiya 93:439-441, Sep-Oct 61 and In the Balaganskaya Cave; Priroda 11, pp. 112, Nov 61)

Unclassified report

DESCRIPTORS: (*Underground structures, *Geology, Archaeology, USSR.)

AD-269 790 Div. 2
(TISTP/FR) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
CLIMATE CONTROL.
21 Dec 61, 3p. (AID rept. 61-170 of Conference on Problems of Climate Control; Akademiya Nauk SSSR. Izvestiya. Seriya Geograficheskaya 5:128-133, Sep-Oct 61)

Unclassified report

DESCRIPTORS: (Conferences on *Control of *Climate.) Meteorology.

AD-269 821 Div. 2
(TISTP/MFA) OTS price $1.60

Army Ballistic Missile Agency, Huntsville, Ala.
A REVIEW ABOUT THE THEORY OF THE CONDENSATION OF DROPS,
by Dietrich E. Gudzent. 20 June 61, 13p. 20 refs. (Rept. no. RR-TR-61-32)

Unclassified report

DESCRIPTORS: (*Water vapor, *Condensation, Theory, Gases, Aerosols, Kinetic theory.) (Physical properties, Surface properties, Thermodynamics, Chemical properties.) (Mathematical analysis, Partial differential equations.)

Information about the formation of drops on the basis of thermodynamics and the theory of kinetics of phases is presented. The development of drops on embryonal droplets and condensation nuclei is explained and quantitatively described. (Author)

AD-269 849 Div. 2, 25
(TIPSP/GRW) OTS price $4.60

General Dynamics/Convair, San Diego, Calif.
TRANSPORT EQUATIONS FOR THE UPPER ATMOSPHERE,
by I. Oppenheim. 30 June 61, 41p. 4 refs.
(Rept. no. ZPh-108)
(Contracts DA 04-495-ORD-31 2 and AF 19(604)7331)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: (*Upper atmosphere, *Transport properties, Equations.) (*Gas ionization, *Irreversible processes, Relaxation time, Quantum statistics, Hydrodynamics.) (Tensor analysis, Partial differential equations.)

The transport equations which describe irreversible processes in the very dilute, reacting, ionized gas mixture which comprises the upper atmosphere are derived. These equations have application in the description of the properties of the ambient atmosphere and in the determination of the effects of the passage of a traversing vehicle through the atmosphere. The intensity and frequency of the radiation emitted in the traversal of a vehicle through the upper atmosphere will be effected by the phenomena described. (Author)

AD-269 865 Div. 2
(TISTP/MFA) OTS price $3.60

Instrument Corp. of Florida, Melbourne.
RESULTS IN GEODETIC PHOTOGRAMMETRY III. PHOTOGRAMMETRIC DETERMINATION OF AZIMUTH OF HIRAN LINES,
by Duane C. Brown. 15 Dec 61, 24p. incl. illus. table, 10 refs. (Scientific rept. no. 2)
(Contract AF 19(604)5967, Proj. 7600)
(AFCRL-62-201) Unclassified report

DESCRIPTORS: (*Geodesics, Geodetic data, *Flash lamps, Reflectors, Azimuth, Sights, Cameras.) (Least squares method, Curve fitting, Time, Polynomials.)

An iterative solution is developed for the determination of the azimuth of Hiran lines for photogrammetric observations of the line crossing trace of an airborne flashing light recorded against the stellar background. Results of a test of the method are reported and recommendations are made for improvement of operational procedures. (Author)

AD-269 884 Div. 2, 6
(TISTP/FR) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
APPLICATION OF WEATHER RADAR TO FALLOUT PREDICTION.
Quarterly technical rept. no. 14, 1 June-31 Aug 61,
by Pauline M. Austin. 15 Sep 61, 9p. incl. illus.
(Contract DA 36-039-sc-75030, Proj. 3A99-07-001-01-03)
Unclassified report

DESCRIPTORS: (Weather forecasting, *Meteorological radar, *Storms, Precipitation, Hail, Atmosphere, Turbulence.) (*Radioactive fallout from Nuclear explosions, Distribution by Storms.)

Special emphasis was placed on the observational program, the primary aims being to test the ability of the 10 cm radar to detect hail and to obtain data suitable for studying the variations in the vertical structure of convective storms during their lifetimes. Both objectives were accomplished. The cooperation of meteorologists associated with one of the local broadcasting stations provided hundreds of reports of hail occurrences. The agreement between the locations at which hail was reported and the tracks of high-intensity contours was excellent. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-269 372 Div. 3
(TISTB/LH) OTS price $8.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
CHEMICAL WEAPONS OF FOREIGN ARMIES AND ANTI-CHEMICAL PROTECTION,
by A. Malshinskiy, tr. by Edward Lachowicz. Sep 60, 96p. incl. illus. tables (CRDL Special pub. no. 4-23)
Unclassified report

Published by DOSAAF (Volunteer Society for Cooperation with the Army, Aviation, and Fleet) Moscow, 1957.

DESCRIPTORS: (*Chemical warfare, *Chemical warfare agents, Chemical bombs, Toxicity, Physiology, Contamination, Decontamination, Protective coverings, Protective clothing, Shelters, USSR.)

This booklet contains basic information about the means of chemical attack that may threaten our population, and information concerning measures for civilian protection. This booklet is intended for a broad distribution to readers, and may be used by civilian instructors of DOSAAF (Volunteer Society for Cooperation with the Army, Aviation, and Fleet) as a textbook for preparing lectures and discussions. (Author)

AD-269 560 Div. 3, 9
(TISTP/JW) OTS price $4.60

New York U. Coll. of Engineering, N. Y.
FIELD ASSESSMENT PROBLEMS. THE DIFFUSION OF POLYDISPERSE PARTICULATE CLOUDS,
by Ben Davidson and Leon Herbach. 15 Nov 61, 41p. incl. illus. 11 refs. (Technical rept. no. 523.01)
(Contracts DA 18-108-cml-6392 and DA 18-108-405-cml-256, Proj. 4-08-04-011-01)
Unclassified report

DESCRIPTORS: (Turbulent flow, *Particles, Atmosphere, Diffusion.) (Friction, *Velocity.) (Mathematical logic, Probability.) *Micrometeorology.

Separation of particles released in the atmosphere is due to small scale turbulence and varying terminal velocity of the particles. The distribution of particles downwind, which satisfies the differential equation of turbulent diffusion, is obtained by numerical integration when the distribution of terminal velocity is lognormal. The non-dimensional ground deposition depends only on the logarithm of the ratio of the median terminal velocity to the friction velocity, and on the coefficient of variation of the terminal velocity distribution. An analytic approximation is obtained, which is quite good for a wide range of basic parameters. Another approximation is used which neglects the variation of terminal velocity. This procedure is reasonable for a much smaller range of basic parameters. Application to a diabatic atmosphere is also given.

4. CHEMISTRY

AD-269 003 Div. 4, 25
(TISTM/EJH) OTS price $2.60

Cornell U., Ithaca, N. Y.
THE EFFECT OF PRESSURE ON THE CRYSTALLIZATION OF POLYETHYLENE FROM DILUTE SOLUTION,
by Bernhard Wunderlich. 30 Dec 61, 20p. incl. illus. 23 refs. (Technical rept. no. 2)
(Contract Nonr-40144)
Unclassified report

DESCRIPTORS: (Toluenes, Solutions, *Polymers, *Ethylenes, *Crystallization, Pressure, High pressure research, High temperature research, *Crystals, *Single crystals, Growth, Crystal structure, Thickness, Measurement, Theory.) Laboratory equipment, Microscopy.

Linear polyethylene was crystallized isothermally from 0.05% toluene solution at atmospheric pressure and up to 6000 atm hydrostatic pressure. At atmospheric pressure a high temperature form of unknown structure was found crystallizing above 90 C. Single crystal lamellae crystallized between 75 and 90 C. Dendrites were formed below 75 C. The temperature dividing the dendritic growth from single crystalline growth increases with increasing pressure. The thickness of crystals grown at approximately constant supercooling, but at elevated temperature and pressure increased only slightly. Determination of the morphology of the crystals and the thickness of single crystal platelets was done using an interference microscope. (Author)

AD-269 050 Div. 4
(TISTM/TCG) OTS price $2.60

Noyes Chemical Lab., U. of Illinois, Urbana.
ELECTROCHEMISTRY OF FUSED SALTS.
Final rept., 1 Oct 55-30 Sep 61,
by H. A. Laitinen. 30 Sep 61, 9p. 5 refs.
(Contract DA 11-022-ORD-1987, Proj. 1486)
(AROD rept. no. 1486:18)
Unclassified report

DESCRIPTORS: (*Electrochemistry, *Liquid metals, *Salts, Metallic compounds, Halides, Electric potential, Measurement.) (Hydrogen, Hydrides, Ions, Electrodes in *Lithium compounds, *Potassium compounds, *Chlorides, Eutectics.) High temperature research, Laboratory furnaces.

A list of titles technical reports and publications arising from research under this contract is presented. Preliminary results are given of an investigation of the H-hydride ion electrode in molten LiCl-KCl eutectic at 450 C. The initial attempts at measurement of the potential of the H-hydride ion electrode were unsuccessful because of the chemical instability of hydride in the presence of available container materials. (Author)

AD-269 067 Div. 4, 25
(TISTM/TCG) OTS price $.50

Politechico di Milano (Italy).
RESEARCHES ON HYDROGEN OVERVOLTAGE ON METALLIC SINGLE CRYSTALS: BISMUTH.
Rept. for Feb 60-Feb 61, on Research on Interface Phenomena,
by L. Peraldo Bicelli, A. La Vecchia, and M. Graziano. Sep 61, 12p. incl. illus. table, 13 refs.
(Contract AF 61(052)144, Proj. 7022)
(WADD TR 61-33) Unclassified report

DESCRIPTORS: (Electrochemistry, Hydrogen, Voltage on *Bismuth, Crystals, *Single crystals, Metallic crystals, Electrodes in Perchloric acid, Solutions, Measurement, Oscillograms.)

Hydrogen overvoltage on Bi polycrystalline and single crystal cathodes, oriented following the (100), (110) and (111) planes, was investigated in $HClO_4$ solutions in a current density range to 100 amp/sq m at 25 and 55 C. The Tafel law holds true at high current density values; the parameters being different for the different electrodes. In the lower current density range, the behavior, as revealed by oscillographic recordings, is anomalous and different from that observed with other metals. (Author)

AD-269 089 Div. 4, 14
(TISTM/GEC) OTS price $.75

Naval Research Lab., Washington, D. C.
PHOTODEGRADATION OF HIGH POLYMERS. PART III - PHOTOLYSIS OF POLY(METHYL METHACRYLATE) IN VACUUM AND IN AIR.
Interim rept.,
by R. B. Fox, L. G. Isaacs and others.
14 Dec 61, 19p. incl. illus. tables, 30 refs.
(NRL rept. no. 5720)
Unclassified report

DESCRIPTORS: (*Polymers, *Methyl radicals, *Acrylic resins, Thin films, *Organic coatings, Decomposition by *Photolysis, Vacuum systems, Air, Ultraviolet radiation, Stability, Solutions, Viscosity, Molecular weight.) (Solar energy, Simulation.)

The photodegradation of poly(methyl methacrylate) films in vacuum and in air by UV radiation from a medium-pressure mercury lamp has been investigated at room temperature. Changes in weight in terms of intrinsic viscosities, the formation of volatile substances, and the increase in the UV absorption of the films were followed as a function of energy absorbed. Quantum yields for random chain scission in poly(methyl

methacrylate) are about 0.04 and 0.02 in vacuum and in air, respectively. Quantum yields in vacuum are the same at 2 and 0.02 microns pressure. The quantum yield for methyl formate is approximately that for chain scission; the formate is accompanied by larger amounts of methanol and very small quantities of monomer. Increased UV absorption occurs after extensive degradation in either air or vacuum and is due to chromophores formed in the polymer rather than in low molecular weight fragments. (Author)

AD-269 099 Div. 4
(TISTM/TCG) OTS price $3.60

Pennsalt Chemicals Corp., Philadelphia, Pa.
PHENYLPHOSPHONIC DIISOCYANATE AND SOME OF ITS REACTION PRODUCTS,
by Ivan C. Popoff and James P. King. Oct 61, 37p. incl. illus. table (Technical rept. no. 28)
(Contract Nonr-268700, Proj. 356-408)
Unclassified report

DESCRIPTORS: (*Phosphorus compounds, Phenyl radicals, *Phosphonyl radicals, *Cyanates and Phosphines, Urea, Synthesis, Temperature, Stability, Pyrolysis, Infrared spectroscopy.) (Catalysts, Ethyl radicals, Amines.) (*Polymers, Polymerization, Copolymerization with Amines, Pyridines or Benzoyl radicals, Guanidines or Methyl radicals, Phenyl radicals, Sulfamyl radicals, Amines, Heterocyclic compounds.) Chemical reactions.

Pure phenylphosphonic diisocyanate (I) and phenylphosphinylidenebis(3-phenylurea) (VI) were prepared and identified; their thermal stabilities were studied. Attempts were made to obtain thermally stable polymers by the addition copolymerization of I with 3,6-diaminotetrazine, benzoguanamine, o-, m- and p-phenylenediamine, sulfamide, 1,3-dimethyl- and 1,3-diphenylsulfamide. The polymerization product with p-phenylenediamine appeared to be a mixture (70% of copolymer or of phenylphosphinylidenebis(3-p-aminophenylurea) or phenylphosphinylidene-3,3'-p-phenylenediurea with 30% of homopolymeric phenylphosphonic diisocyanate) quite stable at 250 C(9.4% wt loss). The product with m-phenylenediamine was considered as a mixture of 80% of copolymer or phenylphosphinylidenebis(3-m-aminophenylurea) or phenylphosphinylidene3,3'-m-phenylenediurea and 20% of homopolymer. (Author)

AD-269 138 Div. 4
(TISTM/EJH) OTS price $1.10

Washington U., Seattle.
PREPARATION OF THE FLUOROSULFONATES: KI(SO3F)4, KBr(SO3F)4, SnCl(SO3F)3, AND CrO2(SO3F)2,
by Max Lustig and George H. Cady. 1961, 4p. 5 refs. (Technical rept. no. 33)
(Contract Nonr-47716)
(ARPA Order no. 26-60, Task 2)
Unclassified report

DESCRIPTORS: (*Fluorides, *Sulfonates of Potassium compounds, Iodates of Bromine compounds or Dioxides, Chromium compounds or Chlorides, Tin compounds, Complex compounds, Synthesis.)

Peroxydisulfuryl difluoride, S2O6F2, reacts with some chlorides to replace Cl by the fluorosulfonate group. This type of reaction was used to prepare SnCl(SO3F)3 from SnCl4 and CrO2(SO3F)2 from CrO2Cl2. S2O6F2 fails to replace the halogen in KBr or KI when reacting at about room temperature. Instead, the complex salts, KBr(SO3F)4 and KI(SO3F)4, are formed. (Author)

AD-269 150 Div. 4, 26
(TISTM/EJH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SOME PROBLEMS OF THE TECHNOLOGY OF CATALYTIC PRODUCTION OF LIQUID PARA-HYDROGEN,
by R. A. Buyanov, A. G. Zel'dovich, and Yu. K. Pilipenko. 20 Dec 61, 12p. incl. illus. table, 8 refs. (Trans. no. FTD-TT-61-192 of Khimicheskaya Promyshlennost', 2:105-108, 1961)
Unclassified report

DESCRIPTORS: (*Liquefied gases, *Hydrogen, Nuclear spins, Production, Catalysis, Laboratory equipment, Industrial equipment, Cryogenics.) (Catalysts, Nickel alloys, Chromium alloys, Iron compounds, Chromium compounds, Manganese compounds, Hydroxides.) USSR.

Methods for the incorporation of catalytic reactors into a system of liquefiers for the conversion of ortho-H2 to para-H2 in systems of H liquefiers were proposed. The optimum conditions for the operation of reactors were determined and loads were recommended. Several problems of the activation of catalysts, their poisoning and work life were analyzed. (Author)

AD-269 273 Div. 4
(TISTM/EJH) OTS price $.75

Naval Research Lab., Washington, D. C.
SURFACE ACTIVITY OF FLUORINATED ORGANIC COMPOUNDS AT ORGANIC-LIQUID/AIR INTERFACES, PART IV. EFFECT OF STRUCTURE AND HOMOLOGY.
Interim rept.,
by Marianne K. Bernett, N. L. Jarvis, and W. A. Zisman. 18 Dec 61, 18p. incl. illus. tables, 17 refs. (NRL rept. no. 5705)
Unclassified report

DESCRIPTORS: (Solutions, *Fluorocarbons, *Organic compounds, *Organic solvents, *Surface tension, Surface properties, Suraces, Fluorination, Molecular structure, Adsorption, solubility.) (*Fluorides, *Esters, Alkyl radicals, Alcohols, Ethanes, Sulforntes, Phenyl radicals, Gultanic acids, Succinates, Allyl radicals, Carboxylic acids, Phthalic acids, Alkoxy radicals, Silanes, Tolunes, Carbamates.)

The surface activity of specially designed fluorinated solutes in 7 organic solvents of different compositions and surface tensions was investigated. By varying the structure and composition of the organophobic, the organophilic, and the connecting polar groups, their contribution to solubility, adsorptivity, and orientation and packing of the solute molecules at the orgainc-liquid/air interface was investigated. The degree of solubility, as well as the packing of the molecules at the surface, was dependent upon fluorination, length, and number of the organophobic chain, and the structure of the organophilic portion. From the force-vs-area isotherms, the lowest area per molecule attainable in each solvent was calculated. The relation of these lowest areas with the corresponding lowest values of surface tension obtained is discussed in terms of solute structure and orientation at the interface. (Author)

AD-269 306 Div. 4
(TISTM/TCG) OTS price $2.60

Southampton U. (Gt. Brit.).
RESEARCH ON ELECTRONICALLY EXCITED STATES AND THEIR REACTIONS.
Technical comprehensive summary rept.,
by R. C. Cookson. 20 May 61, 25p. illus.
16 refs.
(Contract AF 61(052)191)
(AFCRL-856) Unclassified report

DESCRIPTORS: (*Dienes, *Electron transitions, Electron charge, Excitation, Chemical reactions, Molecular structure, *Stereochemistry, Photochemical reactions.) (*Metalorganic compounds, Metals, Carbonyl radicals, *Ketones, Esters, Cyclooctatetraene, Cyclopentenes.) (Acids, Catalysis, *Diels-Alder reactions.) (*Quinones, *Molecular isomerism, Ultraviolet spectroscopy.)

The reaction of dienes, especially bicycloheptadiene, with metal carbonyls was explored. A range of ketones and hydrocarbons were isolated, and the structures and stereochemistry of most were worked out. Both double bonds of the cyclooctatetraene - maleic acid adduct take part in electrophilic addition, forming tetracyclic products. The unusual rearrangement of the acetylene-dicarboxylic ester adduct to derivatives of naphthalene-2;6-dicarboxylic ester was investigated. The Woodward-Katz rearrangement of 8-oxo-dicyclopentadiene takes place very rapidly and is catalysed by Lewis acids. Such acid catalysis has been extended to the inter-molecular Diels-Alder reaction. Ultraviolet irradiation of dimethylbenzoquinones gives a series of cis and trans dimers by addition of two double bonds to form a cyclobutane ring. The cis dimers undergo a second reaction of the same sort to give saturated, box-shaped molecules. 1-Oxo-dicyclopentadiene gives a cage-photoisomer that is remarkably stable. (Author)

AD-269 383 Div. 4
(TISTM/TCG) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
DURATION OF THE SLOW NO DECOMPOSITION REGIME BEHIND SHOCK WAVES AROUND 3000 DEGREE K AND ITS RELATION TO THE RATE COEFFICIENT OF THE EXCHANGE PATH NO + O YIELDS N + O2.
by K. G. P. Sulzmann and C. B. Ludwig. 1 Mar 61, 27p. incl. illus. tables, 11 refs. (Rept. no. ZPH-087)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: (Shock tubes, Shock waves, Decomposition, Reaction kinetics, Exchange reactions, *Nitrogen compounds, *Oxides and Oxygen, High temperature research, Density, Kinetic theory, Mathematical analysis.)

An analysis of the chemical mechanisms governing the first and slow NO decomposition regime behind shock waves around 3000 K is provided. The duration of this regime is essentially inversely proportional to the rate coefficient k6 which governs the exchange path NO + O yields N + O2 and is rather insensitive to changes of additional rate coefficients entering the expression. Comparison of calculated values for the time duration based upon a value k6 equals 2.03 x 10 to the 10th power 1/T2 x exp (-38100/RT) cc/mole/sec with experimental shock tube results shows agreement within 50% for temperatures between 2250 and 3450 K. This result implies the validity of the pre-exponential temperature dependency factor 1/T2 as derived from collision theory for the high temperature extrapolation of the value of k6 determined by previous investigations around 500 K. (Author)

AD-269 615 Div. 4, 25
(TISTM/TCG) OTS price $3.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
FUNDAMENTAL PROBLEMS OF CHEMICAL KINETICS (Oshovnyye Problemy Khimicheskoy Kinetiki),
by N. N. Semenov. 6 July 61, 33p. incl. illus. tables, 15 refs. (Trans. no. MCL-913/1 of Izdatel'stvo Akademii Nauk SSSR, Moskva, 26p., 1959)
Unclassified report

Paper presented at 8th Mendeleyev Conference on General and Applied Chemistry.

DESCRIPTORS: (*Reaction kinetics, *Free radicals, Ions, Electrons, Chemical bonds, Dissociation, Recombination reactions, Chemical reactions, Thermochemistry, Thermodynamics, Paramagnetic resonance, Theory.) (Organic compounds, Halocarbons, Polymers, Ethylenes, Crystals, Phenyl radicals, Acetylenes, Ribose, Nucleic acids.) USSR.

This paper deals with the problems and properties of free radicals. The problems of free radicals in anisotropic structures are discussed relative to the following: thermochemical properties, the methods of electron and ion shock, reaction kinetics, dissociation energies, heat content, and paramagnetic resonance.

AD-269 619 Div. 4
(TISTM/EJH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SYNTHESIS AND INVESTIGATION OF HIGH-MOLECULAR-WEIGHT TERTIARY AMINES AND QUATERNARY AMMONIUM COMPOUNDS FROM COPOLYMERS OF 2-METHYL-5-VINYL-PYRIDINE AND VARIOUS CROSS-LINKING AGENTS,
by A. B. Davankov and L. B. Zubakova. 4 Aug 61, 9p. incl. illus. tables, 9 refs. (Trans. no. MCL-974/1 of Vysokomolekulyarnyye Soyedineniya 2:884-890, 1960)
Unclassified report

DESCRIPTORS: (Methyl radicals, Vinyl radicals, *Pyridines, Polymerization, *Copolymerization with Benzenes and Ethylenes, Glycols, Acrylic resins, Polymers, Chemical reactions, Alkyl radicals, *Amines.) (*Ion exchange resins, Synthesis, Physical properties, Chemical properties.) USSR.

The mechanism and conditions of copolymerization of 2-methyl-5-vinylpyridine with divinylbenzene and with triethyleneglycol dimethacrylate was investigated. Further chemical conversions of the synthesized high-molecular-weight tertiary amines produced quaternary amine compounds insoluble in water and organic solvents. The synthesized products were subjected to various physicochemical tests (the capacity for anionic exchange, chemical stability, water absorption, swelling capacity in organic solvents, etc.). (Author)

Division 4-CHEMISTRY

AD-269 624 Div. 4, 25, 8
(TISTM/EJH) OTS price $3.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CHEMICAL REACTIONS ON THE SURFACE OF GERMANIUM, SILICON, AND THEIR ELECTRONIC ANALOGUES,
by O. V. Krylov and V. M. Frolov. 23 Aug 61, 34p. incl. illus. tables, 73 refs. (Trans. no. MCL-1058/1 of Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva 5:535-543, 1960)
Unclassified report

DESCRIPTORS: (*Semiconductors, *Semiconducting films, Catalysts, *Germanium, *Silicon, Intermetallic compounds, Metallic compounds, Zinc compounds, Nickel compounds, Oxides, Surfaces, Chemical reactions, Catalysis, Reaction kinetics, Adsorption, Impurities, Decomposition, *Surface properties, Theory.) *Bibliography, USSR, Electronic equipment.

Contents:
Electronic processes of chemisorption in semiconductors
Chemisorption on Ge
Chemisorption on Si and other electronic analogues of Ge
Catalytic reactions on the surface of Ge and its analogues

AD-269 632 Div. 4, 9
(TISTM/TCG) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ELECTRICAL FIELD OF A MOVING DROPLET,
by S. S. Dukhin and B. V. Deryagin. 17 Aug 61, 20p. 5 refs. (Trans. no. MCL-1192/1 of Kolloidnyy Zhurnal 11:37-49, 1959)
Unclassified report

DESCRIPTORS: (*Drops, *Electric fields, Electrical properties, Surface properties, Boundary layer, Diffusion, Reynolds number, Kinetic theory, Mathematical analysis.) USSR.

The theory of the electrokinetic diffusion effect of a droplet arising during motion of its surface is given. From calculations made on not excessively large droplets, the fall of which is characterized by Reynolds numbers less than unity, it has been shown that this effect may lead to electrical fields of an intensity of 100 v/cm. The above effect must be taken into account when dealing with ordinary fractions of electrically neutral or close to electrically neutral droplets. The electrokinetic diffusion effect presents a unique possibility for the study of extremely weak adsorption. (Author)

AD-269 681 Div. 4, 32
(TISTB/CCH) OTS price $5.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
TASK SIROCCO. COMMUNITY REACTION TO AN ACCIDENTAL CHLORINE EXPOSURE.
Rept. on Project Summit,
by Louis Segaloff. 15 Nov 61, 42p. incl. illus. 16 refs.
(Contract DA 18-064-cml-2757)
Unclassified report

DESCRIPTORS: (*Poisonous gases, *Accidents, *Chlorine, Chemicals, Reaction (Psychology), Social communication, Sociology.)

Individual and community responses to an accidental chlorine gas exposure in rural Louisiana are examined. The accident is described, and an analysis is made of the informally-organized rescue operations and of the treatment of victims, patterns of communication, assistance provided by organized agencies, and post-emergency reactions. The relationship of behavioral responses to the social and political structures of the community is studied. The pattern of reaction to this emergency can best be described as cooperative, rather than directed. Civil defense is generally viewed by residents of this area as something connected with nuclear warfare. Victims of the gas experienced strong psychological reactions. Even though many victims were exposed to the gas for thirty minutes or more, there was only one human death. Data were assembled for a future comparative study designed to identify, for further investigation, factors which might prove to be of value in extrapolating from various disaster studies to both offensive and defensive situations involving the operational use of B/C weapons and to effective civil defense preparations. (Author)

AD-269 695 Div. 4
(TISTM/EJH) OTS price $6.60

Queen's U., Belfast (Gt. Brit.).
MECHANISMS OF THE OXIDATION OF ORGANIC AMINES BY OXYGEN AND BY FREE RADICAL OXIDIZING AGENTS.
Annual technical rept., 24 July-31 Oct 61,
by M. J. W. Stratford, R. Patton, and W. J. W. Hanna. 31 Oct 61, 63p. incl. tables.
(Contract DA 91-591-EUC-1594)
Unclassified report

DESCRIPTORS: (Butyl radicals, Alkyl radicals, *Amines, *Anilines, *Oxidation, Chemical reactions with Oxygen, Ozone, Manganese compounds, Dioxides, Cumenes, Peroxides.) (Metalorganic compounds, Silver compounds.) (Pyridines, Carboxylic acids, Esters, Free radicals, Alkoxy radicals, Organic solvents.) (Oxidizers, Stereochemistry, Molecular structure, Chromatographic analysis, Spectrographic analysis.)

Oxidation of Amines by Ozone and other reagents: A study of the oxidation of tributylamine by O3 and MnO2 was made. The oxidation products depended on the reaction conditions. The N-oxide was the main product in some solvents whereas attack of O3 at the C next to N occurred in others. Oxidation of tributylamine with MnO2 gave N-formyldibutylamine; similar oxidation occurs with other trialkylamines. Oxidation of Amines by Monovalent Radicals: Examples of the formation of substituted ethylene diamines by reaction of tertiary amines with t-butoxy radicals are given. Dehydrogenative coupling did not occur when t-butoxy-radicals reacted with dimethylaniline in acetic acid solution. The amine was demethylated, the ejected C linking 2, then 3 aromatic rings together. Evidence for intermediate steps in the over-all reaction was obtained. Reactions of Amines in Aqueous Solution with Polyvalent Metal Oxidants: Argentic compounds are uniquely effective for aliphatic amine oxidations in aqueous media. With aqueous solutions of primary amines, argentic picolinate gave aldehydes or ketones in 10-40% yield, while secondary amines gave yields of 20-90% (Author)

AD-269 724 Div. 4
(TISTM/EJH) OTS price $7.60

Sheffield U. (Gt. Brit.).
A STUDY OF THE HALOGENATION OF ALIPHATIC HYDROCARBONS AND DERIVATIVES THEREOF.
Final technical rept. for 1 Mar 58-31 Mar 61 on Research on New Chemical Systems and Methods of Synthesis,
by J. M. Tedder and P. S. Fredricks. Aug 61, 73p. incl. illus. tables, 50 refs.
(Contract AF 61(052)63, Proj. 7023)
(ARL-52) Unclassified report

DESCRIPTORS: (*Halocarbons, *Bromocarbons, *Chlorocarbons, *Fluorocarbons, Synthesis, *Halogenation, Gases, Liquids, Organic solvents.) (Alkyl radicals, Butyl radicals, Allyl radicals, Bromides, Chlorides, Fluorides, Butanes, Hexanes, *Bromination, *Chlorination, *Fluorination.) (Hydrogen, Ions, Free radicals, Chemical reactions, Substitution reactions, Reaction kinetics, Stereochemistry, Temperature, Stability.) (Infrared spectroscopy, Chromatographic analysis.)

Fluorination, chlorination and bromination of the 1- and 2-haloalkanes and related compounds were investigated in the gas phase. Fluorination proved to be the least selective process, bromination the most. A substituent halogen accelerates bromination at the C atom to which substituent is attached, but chlorination is slightly and fluorination strongly retarded at this position. All 3 modes of halogenation are retarded at adjacent sites; fluorination being relatively most affected, bromination the least. Experiments were carried out over a range of temperatures and indicate that changes in reactivity observed are due principally to changes in activation energy for H abstraction. These results throw light on the factors controlling H abstraction by free radicals. Radicals of the type -CHXCH- where X is a halogen atom are relatively unstable. (Author)

AD-269 759 Div. 4
(TISTM/EJH) OTS price $1.10

Southampton U. (Gt. Brit.).
RESEARCH ON ELECTRONICALLY EXCITED STATES AND THEIR REACTIONS.
Annual summary rept.,
by R. C. Cookson. 27 Jan 60, 3p. illus.
(Contract AF 61(052)191)
Unclassified report

DESCRIPTORS: (*Benzenes, Quinones, *Polycyclic compounds, Cyclobutanes, *Ketones, *Electron transitions, Excitation, Stereochemistry, Isomers, Synthesis, Photochemical reactions, Dienes.)

Several bridged-ring ketones have been synthesised having double bonds or aromatic rings with their Pi-electrons near the C of the C=O group. They all show intramolecular charge-transfer spectra. Molecules containing very strained cyclobutane rings have been made by photochemical isomerisation. (Author)

AD-269 788 Div. 4
(TISTM/EJH) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
AIR PURIFICATION IN CONFINED AREAS.
13 Dec 61, 2p. (AID rept. 61-164 of Zhurnal Neorganicheskoy Khimii 6:pp. 2225-2236 and 2470-2480, Oct and Nov 61)
Unclassified report

DESCRIPTORS: (*Air, Purification.) (*Alkali metal compounds, *Sodium compounds, *Potassium compounds, *Oxides, *Peroxides, Carbonates, Synthesis, Chemical reactions, Carbon dioxides, Carbon compounds, Monoxides, Water.) USSR, Closed-cycle ecological systems.

The following information is summarized from literature sources: (1) an improved method for obtaining N_2O_2 and KO_2 by direct oxidation of metal with oxygen is reported. The interaction of NaO_2 with CO_2 was studied; all experiments were made in the presence of water vapor. Above 25 C all reactions resulted in complete discharge of O and the formation of Na_2CO_3 over an intermediate phase of NaOH. Below 10 C only superoxide O was discharged; peroxide O remained in the resultant compound, $Na_2C_2O_6$. A practical method of obtaining $Na_2C_2O_6$ which can be used as a mild oxidizer is discussed. The interaction of NaO_2 or KO_2 with CO is also discussed.

AD-269 888 Div. 4, 30
(TISTM/EJH) OTS price $ .50

Naval Research Lab., Washington, D. C.
DETERMINATION OF THE SURFACE TEMPERATURE OF WATER DURING EVAPORATION STUDIES. A COMPARISON OF THERMISTOR WITH INFRARED RADIOMETER MEASUREMENTS.
Interim rept.,
by N. L. Jarvis and R. E. Kagarise. 19 Dec 61, 10p. incl. illus. 17 refs. (NRL rept. no. 5727)
Unclassified report

DESCRIPTORS: (*Water, Evaporation, *Surface temperatures, Thin films, Monomolecular films, Temperature, Measurement, *Thermistors, Resistance thermometers, *Radiometers, Infrared radiation, Sensitivity.)

The temperature of a water surface was measured by two techniques, one utilizing a commercial Ir radiometer, and the other, thermistor probes. Both methods were satisfactory for following the changes in surface temperature during evaporation studies. The radiometer was less sensitive to changes in temperature than the thermistors, being limited to changes in temperature of 0.1 C or greater. The radiometer has the advantage of measuring the temperature of a much thinner layer of water near the surface than the thermistor (0.1 mm as compared to 2 or 3 mm). It also responds more rapidly to changes in water temperature than the thermistor and does not require contact with the water. (Author)

5. COMMUNICATIONS

AD-269 087 Div. 5, 8
(TISTE/CRJ) OTS price $4.60

New York U., Coll. of Engineering, N. Y.
ERROR PROBABILITY OF CASCADED BINARY COMMUNICA-

TION LINKS PERTURBED BY ADDITIVE GAUSSIAN NOISE AND RAYLEIGH FADING,
by H. D. Goldman and R. C. Sommer. 15 Sep 61, 46p. incl. illus. 8 refs. (Scientific rept. no. 6)
(Contract AF 19(604)6168)
(AFCRL-900) Unclassified report

DESCRIPTORS: (*Communications theory, Radio signals, *Radio transmission, Signal-to-noise ratio, Attenuation, Absorption, Errors.) (Radio communication systems, Radio relay systems, Digital systems, Data transmission systems.) (Satellite vehicles, Communication systems, Very high frequency, Ultra high frequency.)

The performance of cascaded binary communication links in the presence of additive white gaussian noise is investigated for the cases of constant and Rayleigh distributed signal levels. An exact expression is derived for over-all error probability for any number of links with constant signal levels. With Rayleigh fading, the cases of independent and completely correlated fading are considered. An exact expression is derived for average over-all error probability for any number of links with independent Rayleigh fading and identical average signal-to-noise ratios in each link. A simple approximation to this expression is presented for high average S/N. Although the case of completely correlated fading does not yield a general solution in terms of the number of cascaded links, exact solutions for average over-all error probability for 2 and 3 links are determined. (Author)

AD-269 144 Div. 5
(TISTE/CRJ) OTS price $13.50

Bell Telephone Labs., Inc., Whippany, N. J.
UNICOM. UNIVERSAL INTEGRATED COMMUNICATIONS SYSTEM.
Quarterly progress rept. no. 9, Vol. 2, 1 July-30 Sep 61.
30 Sep 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-78806; In cooperation with ITT Federal Labs. and Radio Corp. of America)
Unclassified report

DESCRIPTORS: (*Military communications, *Communication systems, Data transmission systems, *Voice communication systems, Secret communication systems, Teletype systems, *Telephone communication systems, Radio communication systems.) (*Communication equipment, Electronic switches, Trigger circuits, *Switching circuits, Analog systems.) (Speech transmission, Analog to digital converters.)

Contents:
Evaluation of the number and types of switching matrices
Review of signaling arrangements for analog switching
Central processor capacity
A proposed 7090 program for central control simulation
UNICOM store and forward unit
Analysis of data transmission tests over voice channels
Physical design
Tape control unit
Originating register
Time division switch
Signal assembler-distributor
The voice analog-digital converter
2400 bit-per-second modem
Program store card writer

AD-269 193 Div. 5
(TISTW/RD) OTS price $8.60

Bell Telephone Labs., Inc., Whippany, N. J.
UNICOM. UNIVERSAL INTEGRATED COMMUNICATIONS SYSTEM.
Quarterly progress rept. no. 9, Vol. 1, 1 July-30 Sep 61.
30 Sep 61, 91p. incl. illus.
(Contract DA 36-039-sc-78806; In cooperation with ITT Federal Labs. and Radio Corp. of America)
Unclassified report

DESCRIPTORS: (*Military communications, Communication systems, Design.) (Data storage systems, Data transmission systems, Digital systems.) (Computers, Switching circuits, Computer logic, Memory devices.) (*Radio communication systems, *Voice communication systems.) Analog-to-digital converters.

The first partial draft of the System Engineering Plan was issued. Network planning, analyses of the survivability of the phase I and phase II versions of UNICOM is reported. The major work in switching and signaling has been in supporting test model development and in preparing detailed requirements for inclusion in the System Engineering Plan. Transmission and Stations, work on the transmission aspects connecting UNICOM to Signal Corps Automatic Network (SCAN) and indigenous telephone companies was completed. Other work on transmission facilities and digital signal converters was carried on. (Author)

AD-269 194 Div. 5, 25, 8
(TISTP/FR) OTS price $5.60

Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
STUDY OF A SPEECH COMPRESSION SYSTEM (SPECTRUM SELECTION).
Quarterly technical rept. no. 7, 15 June-14 Sep 61
by Karl D. Kryter and Jay H. Ball. 29 Dec 61, 32p. illus. 2 refs.
(Contract DA 36-039-sc-78078)
Unclassified report

DESCRIPTORS: (*Voice communication systems, *Speech transmission, Electronic equipment, Test equipment.) (*Band-selective amplifiers, Band-pass amplifiers, *Band-pass filters, Acoustic filters.) (*Pulse modulation, Pulse generators, Digital systems, Analog-to-digital converters, Timing circuits, Memory devices.) (Psychoacoustics, Intelligibility.) (*Voice communication systems, Intelligibility.) Noise generators.

The effects of sampling the frequency spectrum of speech by narrow pass bands is discussed. Included is engineering information about a new 6-channel filtering system, each channel of which is capable of passing a band of frequencies either 35 or 75 cps wide. Also included are results of experiments on companding, delta modulation and straight pulse code modulation of a speech signal. Preliminary results indicate that the 75 cps wide filters, delta modulation and companding can be used to advantage in the transmission of spectrum sampled speech. (Author)

AD-269 293 Div. 5
(TISTE/NTM) OTS price $2.60

Royal Inst. of Tech. (Sweden).
SPEECH ANALYSIS TECHNIQUES.
Quarterly progress rept. no. 4, 1 July-30 Sep 61,

by Gunnar Fant and Arne Risberg. 30 Sep 61, 15p. illus. 8 refs. (Rept. no. 5)
(Contract DA 91-591-EUC-1496)
Unclassified report

DESCRIPTORS: (Sweden, Speech, Analysis, Data processing systems, Spectrographic analysis, *Speech transmission.) (*Voice communication systems, *Radio communication systems, Intelligibility, Sound transmission, Audiofrequency, Tracking, Band-pass filters, Frequency analyzers, *Speech representation, Acoustics, Low pass filters.)

The work on the 51-channel analyzer was continued. The mechanical assembly of the filterbank was started. Comparative studies of various means of speech spectrum analysis were concerned with formant frequency measurements from Sona-Graph spectrograms and sections. Evaluations of various means of voice pitch extraction were followed up by a complete construction of a dual channel pitch extractor and decision circuit. Development was continued on various methods for automatic recognition of specific phonetic features and sound categories. It was demonstrated that the probability of correct identification of a consonant next to a vowel as a function of the time location of the cut in time generally has a maximum in its rate of rise at the physical boundaries. (Author)

AD-269 406 Div. 5, 30, 8
(TISTP/TL) OTS price $5.60

Air Force Cambridge Research Labs., Bedford, Mass.
EVALUATION OF CONTROL MONITOR AN/GGS-11 PROTOTYPE,
by Robert S. Menchel. Aug 61, 51p. incl. illus. 3 refs. (AFCRL-686: Instrumentation for Geophysics and Astrophysics no. 19)
(Proj. 6650)
Unclassified report

DESCRIPTORS: (*Communication equipment, *Communication systems, *Electronic equipment, *Control systems, Circuits, Trigger circuits, *Electrical networks, Display systems, Data processing systems, Data transmission systems, Multichannel telephone systems, Switching circuits, Magnetic tape, Memory devices.) (Weather communications, Design, Tests.)

The AN/GGA-11 provides a means for a station to subscribe to receive only desired information from traffic passing on a high-speed party line type of communications network. The Control Monitor is also capable of activating one of six transmitters to transmit information upon request from a Master Control Station. The request is a call-up code consisting of a 5-character, 25-bit, call-up word. Each station compares the incoming call-up word with as many as 1000 such words stored on a Mylar disk within the Monitor. Between each call-up word, a complete message is transmitted, and an end of message indication alerts each station to receive the next call-up word, even though a particular station may not have been interested in the previous message. (Author)

AD-269 430 Div. 5, 25, 8
(TISTP/FR) OTS price $46.00

Electro-Optical Systems, Inc., Pasadena, Calif.
DIRECT USE OF SOLAR-ENERGY FOR COMMUNICATION. PART I. ANALYSIS OF SOLAR-OPTICAL COMMUNICATION. Rept. for Mar 59-Sep 61,
by Duane E. Erway,. T. A. Hardin and others.
Sep 61, 1v. incl. illus. tables, 100 refs. (EOS rept. no. 270, (Final) pt. 1)
(Contract AF 33(616)6310, Proj. 4335)
(ASD TR 61-13, pt. 1) Unclassified report

DESCRIPTORS: (*Light communication systems, Solar energy, Feasibility studies.) (Space flight, Communication systems.)

The analytical part of the SOCOM (Solar Optical Communications) program consisted of studies of the theoretical and practical limitations of space communication systems using sunlight as a carrier, together with exploration of ways of simulating and testing such systems on the earth. The areas studied included: wavelength spectrum, optical systems, modulation and demodulation techniques, tracking and stabilization problems, system design, and simulation techniques. (Author)

AD-269 557 Div. 5, 25
(TISTP/JW) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXPERIMENTS IN THE IMPROVEMENT OF THE IMPULSE RESPONSE OF TELEPHONE CIRCUITS,
by Howard L. Yudkin. 27 Nov 61, 6p. illus. 6 refs. (Rept. no. 25G-4)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*High pass filters, *Telephone communication systems, Multichannel telephone systems, Circuits.) (Pulse transmitters, Phase modulation, *Signal-to-noise ratio.) (Data transmission systems, Telephone lines, Telephone signals, Attenuation.)

The problem of shortening the duration of the telephone circuit impulse response by filtering is considered. It is shown that high-pass filtering achieves the desired result with an attendant loss in circuit bandwidth, while perfect phase equalization (matched filtering) obtains better results with no loss in bandwidth. It is also shown that matched filtering results in a more desirable pulse than is obtained by the combination of both matched and high-pass filtering. (Author)

AD-269 558 Div. 5
(TISTW/DLW) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
FLASHING LIGHT ENCODERS,
by Lynn A. Jacobson. 27 Nov 61, 20p. incl. illus. (Rept. no. 312G-1)
(Contract AF 19(604)7400)
(ARPA Order no. 13-61) Unclassified report

DESCRIPTORS: (Light communication systems, Data transmission systems, Pulse communication systems, *Light pulses, Coding, Flash lamps, Pulse generators, Oscillators, Design.) (*Re-entry vehicles, Telemetering data, Coding, Electronic circuits.)

Transmission of data from sub-orbital vehicles is accomplished primarily through the use of RF telemetry methods. One suggested approach to assure data transmission during a RF blackout employs a supplementary flashing light transmitting system. In this system the flashing light encoder has the assignment of transforming data information imposed on a group of FM sub-carrier channels into a form compatable with a flashing light transmitter. The encoder samples the frequency in X-channels and converts each frequency into a time interval between two flashes. The coincidence of the start of one sample with the termination of the previous sample provides for maximum efficiency in the utilization of time and power. (Author)

AD-269 561 Div. 5
(TISTE/CDM) OTS price $3.60

National Cash Register Co., Hawthorne, Calif.
RESEARCH ON MAGNETIC ROD STORAGE AND CONTROL UNITS FOR A SWITCHING CENTRAL OFFICE.
Quarterly progress rept. no. 2, 15 July-14 Oct 61,
by D. Rork and P. Ellinger. 14 Oct 61, 28p. incl. illus. (Technical pub. no. 3405)
(Contract DA 36-039-sc-89212)
Unclassified report

DESCRIPTORS: (*Telephone communication systems, Digital systems, Switching circuits, Panel boards (Electricity), Multiplex transmission, Storage, Control, Design.) (*Multichannel telephone systems, Data transmission systems, Electronic switches, Time interval counters, *Magnetic core switches.)

Work was continued on the design of a high-speed, digital switching central system with a minimum use of semi-conductor devices and a maximum utilization of the magnetic rod as a logical and storage element. Digital switching techniques combined with an efficient use of the magnetic rod will result in a switchboard design with high reliability, coupled with minimal size, weight, and cost. A description of the modified timing cycle for the digital switching central is presented. Magnetic logic mirror notation is described. Major portions of the romote concentrator are presented in detail. (Author)

AD-269 612 Div. 5, 8
(TISTP/WH) OTS price $12.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PROBLEMS OF INFORMATION TRANSMISSION NO. 5 STATISTICAL CODING (Problemy Peredachi Informatsii).
7 July 61, 159p. incl. illus. tables, 7 refs. (Trans. no. MCL-894/1 of Akademiya Nauk SSSR Laboratoriya Sistem Peredachi Informatsiy, Moskva, 125p., 1960)
Unclassified report

DESCRIPTORS: (*Coding, Data transmission systems, Statistical analysis, *Sequential analysis.) (*Information theory, Statistical distributions, *Communications theory, Sequences.) USSR.

The results of experimental studies performed in the last two years in the Laboratory of Information Transmission Systems are presented. This article describes the method of measuring the frequency distribution of message elements from various sources and adduces the results of measurement of frequency distribution which, in the case of certain sources, is carried to the level of 4th-order distributions. In appendices to this collection of articles there are provided tables of the functions necessary to compute the entropy of discrete distribution. (Author)

AD-269 667 Div. 5, 33
(TISTB/MS) OTS price $1.10

Ohio State U., Research Foundation, Columbus.
VARIANCE IN THE RATE OF SPEAKING BY PILOTS AND CONTROLLERS IN COMMUNICATING TO U. S. AND FOREIGN LISTENERS,
by Henry M. Moser, Wallace C. Fotheringham and Guillermo A. Gonzalez. Apr 61, 7p. incl. tables (Technical rept. no. 67)
(Contract AF 19(604)6179)
(AFESD TN 61-41) Unclassified report

DESCRIPTORS: (*Voice communication systems, *Speech, *Speech transmission, Intelligibility, Language, Pilots, Air traffic controllers.)

Recordings of air traffic messages at foreign and domestic international airports were examined to determine if pilots and controllers adjust their rate of speaking in terms of perceived listener needs. It was found that pilots and controllers use a slower rate when speaking in English to listeners whose native language is not English. In general, that data supports a conclusion that pilots and controllers adjust rate of speaking to match perceived listener needs. (Author)

AD-269 796 Div. 5, 8
(TISTP/MFA) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
THEORETICAL PERFORMANCE BOUNDS FOR VARIABLE DATA RATE TRANSMISSIONS ON FADING CIRCUITS,
by John N. Pierce. Nov 61, 9p. 3 refs. (AFCRL-959)
(Proj. 4610)
Unclassified report

DESCRIPTORS: (*Data transmission systems, *Communications theory, Tests, Analysis, Errors, Probability, Frequency shift, Frequency shift keyers, Band-pass filters, Circuits.)

Variable data rate transmissions are considered as a means of counteracting adverse effects of fading. Theoretical bounds on attainable improvements are derived as a guideline to more exhaustive studies. It is shown that relatively simple suboptimum systems offer virtually as good performance as the most elaborate system. (Author)

AD-269 891 Div. 5
(TISTW/RD) OTS price $6.60

National Cash Register Co., Dayton, Ohio.
ON THE DESIGN OF A HIGHLY RELIABLE HF DIGITAL COMMUNICATION SYSTEM. PROBLEMS, DESIGN PROCEDURES AND THE DESCRIPTION OF A PROPOSED DESIGN,
by Klaus Otten. Oct 61, 38p. incl. illus., 8 refs. (Rept. no. 3-4S)
(Contract AF 33(600)42197)
Unclassified report

DESCRIPTORS: (Design of High frequency, Air to surface, *Radio communication systems, *Data transmission systems, *Digital systems.) (Multipath transmission, Frequency shift keyers, Diversity reception, Diversity systems.)

For the optimum design of a digital HF system using pulse redundancy, it was concluded that statistical information on the correlation between disturbances must be known. This information is not available. From other information and by analogy, important design characteristics and requirements for an optimum design can be qualitatively extrapolated: (1) Wide bandwidth (greater than 3 kc) to permit effective utilization of frequency diversity, (2) Interleaving of sub-bits from various information-bits to permit effective utilization of time diversity, (3) Use of short-duration pulses followed by long dead periods to provide high potential protection against multipath distortion by self-interference, and (4) Use of a demodulation technique which utilizes, rather than rejects, multipath signal contributions. However, it was also concluded that it is entirely feasible to design and build a 3 kc bandwidth system which will offer substantial performance advantages over an FSK (frequency shift keying) system. (Author)

6. DETECTION

AD-269 083 Div. 6, 30
(TISTW/DLW) OTS price $6.60

New York U. Coll. of Engineering, N. Y.
SPECIAL PURPOSE ANALYSIS TECHNIQUES.
Final rept. 1 July 60-31 Aug 61,
by R. Archbald, D. Hoffman and others.
31 Aug 61, 66p. incl. illus. tables, 5 refs.
(Contract DA 36-039-sc-84968, Proj. 3-99-06-001-01)
Unclassified report

DESCRIPTORS: (*Direction finding, Automatic, *Radio interception, Radio signals, High frequency, Radio receivers, Bearing finding, Display systems, *Digital computers, Pulse analyzers, Calibration, *Loop antennas, Antennas, Design, Tests.) (*Radio signals, Detectors, Identification, Data storage systems, Analysis.)

An experimental model of an automatic direction finder was assembled. A description is given of the antenna and receiver sections of the system. The method used to calibrate the processing and display units is shown. Field tests, to determine the performance of the system, are described and the results evaluated. Progress is included which was made on the experimental program for determining the feasibility of using a general purpose digital computer for signal analysis problems. A computer program for pulse signal analysis using the laboratory model of the computer-receiver system was prepared. (Author)

AD-269 092 Div. 6, 12, 15
(TISTP/WH) OTS price $9.60

Philco Corp., Palo Alto, Calif.
POLYSTATION DOPPLER TRACKING.
Final rept., vol. 2.
June 61, 1v. incl. illus. (Rept. no. WDL-TR 1589)
(Contract AF 19(604)6647)
Unclassified report

DESCRIPTORS: (*Doppler tracking, Satellite vehicles, Mathematical analysis, Analytic geometry, Equations, Matrix algebra.) (*Satellite vehicle trajectories, Mathematical analysis, Statistical analysis, Least squares method.) (Errors, Propagation, Analysis of variance, Determinants.)

The mathematics for POLYDOP is presented. The development starts with the derivation of the basic mathematical relations. The conditions necessary for the existence of a unique solution to these equations are discussed, and the solutions to a number of POLYDOP system equations are presented. The problems that appear when more than one vehicle is in the region of observation of the system at any given time are discussed. Situations are considered in which the same data might be taken even if the vehicle paths corresponding to this data are not the same. The problem of conversion of range information into Cartesian coordinate information is treated. The two most common measures of error propagation and a method for finding the points of intersection of two conics are included. (Author)

AD-269 101 Div. 6, 12
(TISTW/DLW) OTS price $8.10

Philco Corp., Palo Alto, Calif.
POLYSTATION DOPPLER TRACKING.
Final rept. vol. 1.
June 61, 1v. incl. illus. 33 refs. (Rept. WDL-TR1589)
(Contract AF 19(604)6647)
Unclassified report

DESCRIPTORS: (*Doppler tracking, Doppler systems, Tracking, *Satellite vehicles, Radio transmitters, Airborne, Orbital flight paths, Determination, Feasibility studies.) (Radio stations, Radio receivers, Data processing systems, Position finding, Errors, Effectiveness.)

Investigations were made of doppler tracking systems having more than one station. The development is discussed of simple analytical techniques for solving the system equations, and for studying the behavior of the system equations in the presence of errors. It was found possible to solve the system equations in explicit form for many cases and a successful iterative scheme was found for another case which did not yield to explicit solution. Methods of describing error propagation were developed. It was concluded that the problem can be solved without massive digital computations. Methods were developed for limiting error by controlling location of tracking stations. (Author)

AD-269 585 Div. 6, 15
(TISTW/DLW) OTS price $11.50

Radiation Lab., U. of Michigan, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS - XLVI. THE

CONVERGENCE OF LOW FREQUENCY EXPANSIONS IN SCALAR SCATTERING BY SPHEROIDS,
by T. B. A. Senior. 31 Aug 61, 143p. incl. illus. tables, 7 refs. (Scientific rept. no. 4; rept. no. 3648-4-T)
(Contract AF 19(604)6655)
(AFCRL-787) Unclassified report

DESCRIPTORS: (*Radar echo areas, Radar reflections, Electromagnetic wave reflections, *Ellipsoids, Bodies of revolution, Scattering, Diffraction, Theory, Partial differential equations, Wave analysis, Mathematical prediction, Mathematical analysis.)

For the scalar problem of the diffraction of a plane wave by a spheroid the exact solution is known, and at low frequencies the expression for the far field amplitude can be expanded in a series of increasing positive powers of ka, where k is the wave number and 2a is the interfocal distance. This is the Rayleigh series, and is convergent for sufficiently small values of ka. To determine the range of frequencies for which this expansion is applicable an essential factor is the radius of convergence, and the discussion is devoted entirely to the calculation of this quantity. Attention is concentrated on the case in which the plane wave is incident nose-on, and the radius of convergence is obtained as a function of the length-to-width ratio for prolate and oblate spheroids, hard as well as soft. For other angles of incidence it can be shown that the radius is not greater than this, and in most instances it would appear to be the same. (Author)

7. ELECTRICAL EQUIPMENT

AD-269 030 Div. 7, 12
(TISTA/WAW) OTS price $2.60

General Dynamics/Astronautics, San Diego, Calif.
SM 65. AIRBORNE POWER SUPPLY SYSTEM TEST (FACTORY) TEST PROCEDURE,
by W. K. Moore. 19 Apr 61, 25p. incl. tables.
(Rept. no. 27-98509-3, rev. R)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, Electrical equipment, Electronic equipment.) (Airborne, *Power supplies, Automatic, Test methods, *Test sets.)

The procedure for testing the airborne power supply (APS) using Deck 9-702 in the automatic programmed checkout equipment (APCHE) is described. Deck 9-702 performs a test to determine the operational readiness of the APS. The APS inverter is started on Ground Power with no load and its voltage and frequency are checked. The inverter input is then transferred to internal (simulated battery) power, and its output is transferred to the missile loads. The voltage and frequency of the inverter output are again measured. (Author)

AD-269 034 Div. 7, 25
(TISTE/CRJ) OTS price $1.60

General Electric Co., Utica, N. Y.
RESEARCH AND DEVELOPMENT ON THERMOCOUPLE ENERGY CONVERTERS (PHASE II).
Quarterly progress rept. no. 2, 12 July-1 Oct 61, on phase 2,
by W. J. van der Grinten. 1 Nov 61, 13p. incl. illus.
(Contract DA 30-069-501-ORD-3294, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: (*Thermocouples, *Thermoelectricity, *Power supplies, Lead compounds, Tellurides, Manufacturing methods, Design.) (Generators, Seals, Materials.)

Efforts are being made to develop techniques for fabricating, in quantity, good quality n- and p-type thermoelectric lead telluride cells and to assemble these cells to form 2 thermoelectric devices which will meet the following requirements: (a) each of the 2 thermocouple energy converters will consist of 9 couples and will have an output of 7.5 watts/cubic inch or better at a minimum load current of 20 amp when a temperature gradient of at most 600 K/cm exists across the thermoelectric material; (b) the converters will be capable of operation with the hot side of the thermoelectric material near its melting point (917 C) and the performance indicated should be attainable at a hot side temperature of at least 1000 K; and (c) the devices should be operable for a minimum of one hour. Current effort has resulted in perfecting the casting technique so that n- and p-type cells can be manufactured in quantity. Also, the design and fabrication of the complete cell assembly including a hermetic seal at the cold junction side, having a maximum temperature capability of 780 C, was realized. (Author)

AD-269 155 Div. 7
(TISTE/NTM) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A SMALL SELF-EXCITING ROTOR-TYPE ELECTROSTATIC GENERATOR,
by A. F. Kalganov. 20 Dec 61, 11p. incl. illus. 24 refs. (Trans. no. FTD-TT-61-188 of Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika 4:20-26, 1960)
Unclassified report

DESCRIPTORS: (*Electrostatic generators, *Miniature electrical equipment, USSR, Design.) (Generators, Rotating structures, Cylindrical bodies, Electrostatic capacitances, Test methods, Test equipment, Tests, Mathematical analysis.)

Study of the generator has shown satisfactory agreement between experimental and computational data obtained using the true value of the stray-capacitance factor; this substantiates the fact that the refined method of designing the given type of electrostatic generator is correct. (Author)

AD-269 180 Div. 7, 12
(TISTW/DLW) OTS price $7.60

Curtiss-Wright Corp., Princeton, N. J.
SOLAR THERMOELECTRIC GENERATORS FOR APPLICATION

OUTSIDE THE EARTH'S ATMOSPHERE.
Rept. on Phase 1, Nov 59-Feb 60.
Feb 60, 66p. incl. illus. tables, 86 refs.
(Contract DA 44-177-tc-622, Proj. 9R99-01-004)
(TCREC TR 61-77) Unclassified report

DESCRIPTORS: (*Thermoelectricity, Generators, *Power supplies, *Electric propulsion, *Solar energy, Space environmental conditions, Thermocouples, Alloys, Semiconductors, Materials, Reflectors, Heat transfer, Electric power production, Airborne, Effectiveness, Feasibility studies.)

Results are presented of a basic research project in two phases to determine feasibility of solar thermoelectric generators outside of the earth's atmosphere. It was concluded that simultaneous solutions of two problems are required: (1) Solar energy collection and heat sink radiation efficiency must be as high as possible to obtain the widest possible temperature difference between the hot and cold junctions of the thermoelectric generator. Using selective absorbing and radiating surfaces on flat-plate collectors, and 10- to 20-fold concentrating collectors, a temperature difference of 200 to 520 C can be reached with a collection efficiency in excess of 50%; and (2) Thermoelectric efficiency with materials presently available can reach 9% efficiency with a factor of merit Z = 0.002 per C. With Z = 0.004, an efficiency of 19% could be attained at 500 C temperature difference. Flat-plate and oriented concentrating collectors are also discussed. (Author)

AD-269 227 Div. 7, 4
(TISTM/TCG) OTS price $9.60

General Electric Co., Lynn, Mass.
RESEARCH ON LOW TEMPERATURE FUEL CELL SYSTEMS.
Technical summary progress rept. no. 19,
1 Nov 59-30 Nov 61.
30 Nov 61, 117p. incl. illus. tables, 16 refs.
(Contract DA 44-009-eng-3771)
Unclassified report

DESCRIPTORS: (*Fuel cells, Liquids, Hydrocarbons, Oxidation-reduction reactions, Low temperature research, Gases.) (Electrodes, Electrolytic cells, Structures, Catalysis.) (Catalysts, Platinum, Metals.) (Electrolytes, Acids, Hydroxides.) (Chemical reactions, Adsorption, Volumetric analysis, Anodes (Electrolytic cell).)

Fuel electrode studies resulted in the following: Development of two electrode structures for carrying out fuel and electrocatalyst investigations in matrix-type fuel cells, and cell structures including one with reference electrodes; A survey of chemical elements for electrocatalytic activity with H, hydrocarbons, and other fuels, C base electrocatalysts for activity with H, hydrocarbons, and O, and a number of mechanical mixtures and compounds and a few alloys for electrocatalytic activity in fuel cells; Identification of Pt as the most active simple catalyst for anodic oxidation of hydrocarbons in fuel cells; Discovery that saturated hydrocarbons are more rapidly oxidized in acidic electrolyte cells as compared with basic electrolyte cells and that with olefins the electrolyte effect is smaller and in favor of the basic electrolyte; and Identification of strong effects of electrolyte upon adsorption rates of hydrocarbon fuels which correlates with the observations of the preceding item. (Author)

AD-269 414 Div. 7
(TISTW/DLW) OTS price $7.60

Goodyear Aircraft Corp., Akron, Ohio.
SOLAR ORIENTING DEVICE FOR EXPANDABLE FLAT-PANEL ARRAY.
Quarterly progress rept. no. 1, 1 July-30 Sep 61,
by G. J. McKeel. 4 Oct 61, 69p. incl. illus. tables.
(Contract DA 36-039-sc-88913)
Unclassified report

DESCRIPTORS: (*Solar cells, *Electric power production, Solar energy, Thermal radiation, Sun, Tracking, Focusing, Detectors, Rotating structures, Design, Sensitivity, Tests.) (Power supplies, Feasibility studies.)

A study is presented of static and dynamic solar panel systems for the optimum conversion of solar radiation to electrical energy. The influence of solar panel orientation on energy collected is analyzed to determine the percentage change in available total solar radiation over the day period. Preliminary panel driving-power requirements are established for the assumed wind loading of the 20-sq-ft panel. Open- and closed-loop orientation systems are investigated and recommendations are given according to weighting factors. Solid-state detector techniques are analyzedand orientation sensors are examined for their applicability to the over-all system with reference to performance, required equipment, accuracy, and cost. The geometry of the wedge-type orientation sensor is given with curves of sensitivity and total sensor output versus rotation from the Sun line. A description of the first feasibility-demonstration model of the wedge-type orientation sensor is included. (Author)

AD-269 508 Div. 7, 4
(TISTM/TCG) OTS price $5.60

Electro-Optical Systems, Inc., Pasadena, Calif.
CHEMICAL REACTIONS TO CONVERT SOLAR ENERGY INTO POWER SOURCES.
Rept. for 15 May 59-1 Apr 61,
by J. J. Rowlette.
Sep 61, 44p. incl. illus. tables, 31 refs.
(Contract AF 33(616)6546, Proj. 7117)
(ARL-60) Unclassified report

DESCRIPTORS: (*Solar cells, *Solar energy, Photochemical reactions, Regeneration, Electrolytic cells, *Power supplies, Chemical reactions, Thermochemistry.) (Synthesis, Hydrogen compounds, Peroxides, Liquids, Gases and Temperature, Decomposition, Photolysis, *Sulfur compounds, *Oxides.) (Catalysts, Cadmium compounds, Tellurides, Zinc compounds, Oxides.) Laboratory equipment.

Photochemical synthesis of H2O2 and the combined thermal-photochemical decomposition were studied for the ultimate possibility of using sunlight for regenerative electrolytic cells, or for the purpose of making H2O2 for other high energy applications. Theoretical analysis of the photolysis and thermal decomposition of SO3 strongly indicated that a combination of a photochemical and thermal decomposition would not yield a decomposition greater than the 2 processes used separately. H2O2 synthesis was accomplished in both liquid and gaseous states using cadmium telluride and zinc oxide as photocatalyst. Without organic additives in the liquid phase, neither catalyst shows any promise. In the presence of the additives, the reactions are always exothermic and consequently of no value for energy conversion. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-269 638 Div. 7
(TISTE/CRJ) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A POWERFUL AC-DC CONVERTER,
by N. S. Klimov. 17 Aug 61, 14p. incl. illus. 7 refs. (Trans. no. MCL-1224/1 of Elektrichestvo 9:29-34, 1960)
Unclassified report

DESCRIPTORS: (*Rectifiers, Switching circuits, Phase transformers, Electrodes, USSR, Design.)

The difficulties in creating powerful rectifiers are mainly due to the fact that high voltage accumulates in the discharge gaps which undergo preliminary ionization; this decreases their electrical and rectifying strength. In the examined converter the air gaps (at a pressure of 5-10 abs atm) are not ionized, since with air pressure greater than 3 abs atm and voltages less than discharge voltages, there is no corona discharge. The converter consists of a transformer unit which creates a multiphase closed winding, a switching device, and rectifiers. (Author)

AD-269 887 Div. 7
(TISTA/VGW) OTS price $2.60

Monsanto Research Corp., Dayton, Ohio.
HIGH TEMPERATURE THERMOELECTRIC GENERATOR.
Quarterly technical progress rept. no. 1, 1 Oct-29 Dec 61,
by C. M. Henderson, R. G. Ault and others.
29 Dec 61, 23p. incl. illus. tables (MRC rept. no. 2509)
(Contract AF 33(657)7387, Proj. 3145)
Unclassified report

DESCRIPTORS: (*Thermoelectricity, *Generators, Electric power production, Power supplies, Design.) (Thermocouples of Tantalum, Titanium, Molybdenum, Tungsten, Graphite, Manufacturing methods, Tests.)

Applied research and development is reported on a laboratory thermoelectric generator operating at a hot junction temperature of 1200 C and a cold junction of 500-700 C in a vacuum of 1/100,000 mm Hg. Apparatus needed to fabricate and test candidate junction materials and modules for use with a new proprietary thermoelectric material, MCC 50, are described. Tests to be conducted include mechanical strength, sublimation loss, electrical properties, thermal shock and resistance to solid-state diffusion. Preliminary efforts to produce modules of MCC 50 in combination with tantalum, titanium, molybdenum and tungsten by hot press, resistance welding and brazing were only partially successful. However, a graphite-MCC 50-graphite module was produced which exhibited juntions of promising mechanical strength and preliminary measurements of its electrical properties were made. (Author)

AD-269 892 Div. 7, 25
(TISTP/CCH) OTS price $3.50

Naval Research Lab., Washington, D. C.
DIRECT ENERGY CONVERSION LITERATURE ABSTRACTS.
Sep 61, 208p.
Unclassified report

DESCRIPTORS: *Bibliography, *Energy, Conversion ratio, *Thermoelectricity, Thermionic emission, Photoemission, Photoelectric cells, *Magnetohydrodynamics, Electrochemistry, Fuel cells, Primary batteries, Storage batteries, Nuclear energy, Solar energy, *Power supplies, *Solar cells.

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-269 002 Div. 8, 25
(TISTP/WH) OTS price $10.50

Cruft Lab., Harvard U., Cambridge, Mass.
(No title).
Annual progress rept. no. 60, 1 July 60-1 July 61,
by J. A. Pierce, R. W. P. King and others.
1 Aug 61, 104p. incl. illus. tables, refs.
(Contracts Nonr-186607 and AF 19(604)4118)
Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Propagation, Very low frequency.) (*Solid state physics, Electrons, Paramagnetic resonance, Nuclear magnetic resonance.) (*Electromagnetic waves, Antennas, Scattering, Reflections.) (*Ferromagnetism, Materials, Microwaves, Resonance. (*Communications theory, *Control systems, Statistical analysis, Electrical networks.)

Contents:
Very low frequency propagation
Electron and solid state physics
Electromagnetic radiation
Microwave applications of ferrimagnetic materials
Communication and control systems
  Statistical communication theory
  Active networks
  Automatic control theory

AD-269 016 Div. 8, 15
(TISTP/MFA) OTS price $2.60

Colorado U., Boulder.
A VECTOR FORM OF COMPENSATION THEOREM AND ITS APPLICATION TO BOUNDARY-VALUE PROBLEMS.
Scientific rept. no. 2, June 59-Dec 60,
by R. Mittra. 15 June 61, 19p. incl. illus. 3 refs.
(Contract AF 19(604)4556)
(AFCRL-575) Unclassified report

DESCRIPTORS: (*Electrical networks, *Electromagnetic fields, Continuous media, Electromagnetic waves, Dielectrics, Waveguides, Diffraction, Scattering, Impedance.) (*Vector analysis, Integral equations.)

The compensation theorem is extended to a vector form. The use of the vector form would enable one to obtain the expression for the incremental changes in the electric and magnetic vectors in space due to a given source, under the condition of changes in the electrical characteristics in a portion the medium surrounding the source. It is worthwhile to point out the need for deriving a vector form of the theorem. The present method enables one, in a first case, to formulate the boundary value problem in terms of Fredholm's integral equation. There is therefore a possibility of obtaining approximate solutions of this equation by using iterative or other systematic schemes. (Author)

AD-269 033 Div. 8, 14, 26
(TISTM/EJH) OTS price $4.60

General Electric Co., Schenectady, N. Y.
RESEARCH ON BINDER TECHNIQUES FOR HIGH TEMPERATURE RADOME STRUCTURES.
Interim engineering rept. no. 2, 18 July-17 Oct 61,
by Henry T. Plant, P. P. Keenan, and W. H. Marks.
17 Oct 61, 34p. incl. illus. tables.
(Contract AF 33(616)8176, Proj. 1-(670-4161))
Unclassified report

DESCRIPTORS: (*Radomes, Materials, Reinforcing materials, Ceramic materials, Ceramic fibers, Asbestos fiber, Mica, Aluminum compounds, Phosphates, Silicon compounds, Dioxides, Glass, Spheres, *Laminates, *Binders, Filament wound construction.) (High temperature research, Dielectric properties, Mechanical properties, Viscosity, Manufacturing methods, Aging.) Porous materials.

Microwave electrical data on high temperature radome materials, mica laminate and silica fiber-reinforced aluminum phosphate are discussed. Preliminary data has been gathered about silica fiber-reinforced aluminum phosphate laminates containing glass microspheres. Both materials have dielectric characteristics suitable for 1000 F radome applications. Use of inorganic glass microspheres as filler for aluminum phosphate binders results in lower processing viscosity, and the microsphere filler allows about half the water to be removed from the formulations without causing high viscosity or premature gelling. No improvement in electrical characteristics was noted. One formulation presented greater laminate flexural strength. Long-term aging problems exist in the silica fiber-aluminum phosphate laminate system. The laminates lose as much as one-half of their 1000 flexural strength after exposure for 100 hours at 1000 F. Even more drastic loss in strength occurs between initial room temperature strength and room temperature strength after exposure to elevated temperatures. The mica laminate (XS-1342) does not exhibit this loss at 800 F. (Author)

AD-269 047 Div. 8, 26
(TISTW/DLW) OTS price $1.60

Itek Corp., Waltham Mass.
PRODUCTION ENGINEERING MEASURES FOR QUARTZ CRYSTAL FILTER UNITS AT 15MC, 20MC, 20.55MC, 25MC, 30MC.
Quarterly progress rept. no. 1, 1 July-30 Sep 61,
by R. G. Kinsman. 30 Sep 61, 21p. incl. illus. tables.
(Contract DA 36-039-sc-85962)
Unclassified report

DESCRIPTORS: (*Quartz crystals, *Crystal filters, Crystals, High frequency, Radiofrequency filters, Quartz resonators, Design, *Production, *Manufacturing methods, Tests.)

Crystal filters at 15, 20, 20.55, 25 and 30 mc will be fabricated from natural and cultured quartz, anticipating the possible shortage of natural quartz during a national emergency. Mass production techniques and facilities will be defined which will make it possible to reduce the time required for delivery of production quantities during an emergency. The basic design concept to be used on all crystal filter units was established and detailed design work was initiated. (Author)

AD-269 064 Div. 8
(TISTE/NTM) OTS price $8.10

Electron Physics Lab., U. of Michigan, Ann Arbor.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF LARGE-SIGNAL TRAVELING-WAVE TUBES.
Quarterly progress rept. no. 5, 1 July-1 Oct 61,
by G. T. Konrad, S. G. Lele and others. Oct 61,
76p. incl. illus. (Rept. no. 03736-10-P)
(Contract AF 30(602)2303, Proj. 5573)
(RADC TDR-61-272) Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Klystrons, *Microwave amplifiers, Ultra high frequency, Helixes, S band, Theory.) (Amplifiers, Electron tubes, *Electron guns, Cathodes (Electron tubes), Space charges, Density, Distribution, Green's function, Mathematical analysis.) (Electron beams, Plasma physics, Gas ionization, Electric fields.)

A general 2-dimensional nonlinear interaction theory is developed for traveling-wave tubes and specialized to include klystrons. The equations are developed using a Lagrangian analysis and the space-charge fields are found by 2-dimensional Green's function techniques. Experimental data are given on a UHF Crestatron designed to operate over the frequency range from 300 to 900 mc. Both cold-test and hot-test measurements are given on tube No. 4 operating under pulsed conditions. The design of a microperveance-one axially symmetric electron gun with the Poisson cell is outlined and detailed information on the space-charge density distribution and potential gradient at the cathode are given. (Author)

AD-269 065 Div. 8
(TISTE/CRJ) OTS price $2.60

Electron Physics Lab., U. of Michigan, Ann Arbor.
HELIX COUPLERS FOR LINEAR-BEAM DEVICES,
by Chai Yeh. Sep 61, 24p. incl. illus. 5 refs.
(Technical rept. no. 50; Rept. no. 03783-5-T)
(Contract NObsr-81403, Proj. no. SF-0100201)
Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Microwave amplifiers, *Coupling circuits, Electronic circuits, Helixes.) (Electron beams, Space charges, Radiofrequency powder, Theory, Mathematical analysis.)

The interaction between electron beams and coupled helices is studied and generalized to include the effects of (1) space charge, QC; (2) finite circuit loss, d; (3) finite values of gain parameter, C; (4) an unrestricted coupling parameter, k; and (5) the effect of having a large positive value of the velocity parameter,

b, such that the propagation constants are purely imaginary. A general determinantal equation including all these factors is derived from the coupled-circuit equations and the stream equation. Curves of the propagation constants for a variety of operating parameters are shown. Attention is called to the fact that a region of growing wave is found for large positive b for extremely tight coupling. The extent to which the growing-wave island is affected by the various operating parameters is illustrated. Equations for the outer and inner helix RF voltages are derived from which curves of the propagating RF powers along the helices are computed and plotted. (Author)

AD-269 079 Div. 8, 26
(TISTE/NTM) OTS price $1.60

Motorola, Inc., Phoenix, Ariz.
MINIATURE THIN-FILM INDUCTORS.
Interim development rept. no. 2, 1 Sep-1 Dec 61,
by F. R. Gleason. 1 Dec 61, 15p. incl. illus. tables (Rept. no. WP-2631-6)
(Contract NObsr-85397)
Unclassified report

DESCRIPTORS: (*Coils, *Radiofrequency coils, *Miniature electronic equipment, Ferromagnetic materials, Ferrites, Thin films, Nickel alloys, Zinc alloys, Cobalt alloys, Electroplating, Processing, *Manufacturing methods, Production, Design.) (Coils, Inductance, Measurement.)

Research was continued on the development of a method for fabricating miniature inductors employing thin-film spiral conductors on ferrite substrates. Studies and evaluations are presented of various ferrite substrates, the fabrication of conducting spiral patterns, and measurement of the inductances and Q values obtained at one megacycle per second. The choice of ferrite materials is discussed along with techniques for obtaining large-value inductances. (Author)

AD-269 134 Div. 8
(TISTA/VGW) OTS price $6.60

Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH ON ELECTRON BOMBARDMENT INDUCED CONDUCTIVITY TARGETS IN CAMERA TUBES.
Rept. for June 59-15 Nov 60 on Research on the Quantum Nature of Light,
by J. Lempert and G. Klotzbaugh. Nov 60, 64p. incl. illus. tables, 16 refs.
(Contract AF 33(616)6496, Proj. 4156)
(WADD TN 60-307)
Unclassified report

DESCRIPTORS: (*Camera tubes, *Iconoscopes, Electron bombardment, Conductivity, Secondary emission, Signal-to-noise ratio, Electron multipliers, Arsenic compounds, Sulfides, Halides, Selenides, Alkali metal compounds, Thin films, Targets for Image tubes, Image intensifiers (Electronics), Theory, Design, Tests.) Mathematical analysis.

A method for calculating the resolution capabilities of a camera tube as a function of input illumination and tube design parameters is described. A description of experimental work on a successful method for obtaining a high minification image in a combination magnetic and electrostatic focused image tube is given. Results of an investigation of different target materials of the electron-bombardment-induced-conductivity type are reviewed. The construction and test of experimental camera tubes, consisting of high voltage variable-minification image sections, high gain targets of the electron-bombardment-induced-conductivity type, and scan sections with return beam multipliers, are discussed. (Author)

AD-269 157 Div. 8, 26
(TISTE/CDM) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
STANDARD RELIABILITY COEFFICIENT OF ELECTRONIC PRODUCTS,
by P. M. Rabinovich. 13 Dec 61, 5p. incl. tables (Trans. no. FTD-TT-61-139 of Standartizatsiya 2:11-13, 1960)
Unclassified report

DESCRIPTORS: (USSR, *Electronic equipment, Production, Standards, *Reliability, Mathematical analysis.)

The concept of reliability of mass products of the radio engineering industry is discussed. The errors committed during the testing of goods can be eliminated by introducing the concept of standard reliability, under which it should be understood that the conformity of the manufactured goods must comply with standards and technical requirements revealed in the process of selective plant tests of their functional properties. The concept of standard reliability permits a quantitative evaluation of the production quality by each type of test separately, and by all types of tests taken together, and also determines the percentage of serviceable production and rejects in the entire batch of goods by dividing the latter into separate types. (Author)

AD-269 161 Div. 8
(TISTE/CRJ) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
BEAT AMPLIFIER,
by V. Zima. 12 Dec 61, 17p. incl. illus. 10 refs. (Trans. no. FTD-TT-61-15 of Ceskoslovensky Casopis Pro Fysiku 10:499-510, 1960)
Unclassified report

DESCRIPTORS: (*Parametric amplifiers, *Feedback amplifiers, Radiofrequency oscillations, Impedance, Resistance, Inductance, Theory, Mathematical analysis.) (*Communication equipment, Electronic circuits, USSR.)

Efforts are presented on the study of a beat amplifier. A linear theory for a selective active tri-pole with complex parameters was developed. The introduction of the stability factor k resulted in the characterization of the gain, band width, effect of gain and band width, the zone of periodic oscillations independent from the circuit structure and the optimum external parameters. Investigation of a beat amplifier is of primary importance in telecommunications practice since it can amplify extremely weak pulsed signals. A further advantage is the evident frequency reduction in the input circuit. The linear theory of an active tri-pole with complex parameters shows that the problem of impedance accommodations can be quite easily solved

by equal lines of operational gain caused by the introduction of original active quadripoles with real parameters. On the basis of definite simplified assumptions, conditions were derived which are useful in the realization of conventional neutralized and beat amplifiers. (Author)

AD-269 211 Div. 8, 5
(TISTE/NTM) OTS price $5.60

DECO Electronics, Inc., Boulder, Colo.
SOME CHARACTERISTICS OF HORIZONTAL DIPOLE ANTENNAS AT E. L. F.
by E. L. Maxwell and A. J. Farstad. 12 Dec 61, 47p. incl. illus. (Rept. no. 30-F-2)
(Contract Nonr-338700, Proj. NR 371-590)
Unclassified report

DESCRIPTORS: (*Dipole antennas, *Communication equipment, Electrical properties, Earth, Conductivity, Electric fields, Very low frequency, Impedance, Attenuation, Electromagnetic waves, Mathematical analysis, Measurement, Tests.) Antennas.

The performance of any antenna is dependent on the electrical properties of the earth beneath it. Unlike a vertical dipole, the horizontal dipole antenna operates best over a poor, low conductivity material. When positioned electrically close to a lossy material such as the earth (which it must be at VLF and ELF), it is a very inefficient radiator. Nevertheless, its power radiating capability may easily be made to exceed that attainable from existing vertical dipoles (VLF antennas) at ELF. This is true basically because the vertical dipole is voltage limited while the horizontal dipole is current limited. Apparent conductivities were measured in 2 locations - Boulder, Colorado, and Pole Mountain District of the Medicine Bow National Forest, Wyoming. Antenna performances for arbitrary 10 mile long horizontal dipoles are calculated for each location at frequencies from 12 to 330 c. Vertical electric fields which would be produced at distances of 1,000, 4,000, and 10,000 km by a 1 megawatt transmitter with a 10 mile antenna located in the Pole Mountain District are also given. The Precambrian granite in the Pole Mountain District was found to have an effective conductivity as seen by an incident electromagnetic wave of approximately 1/100,000 mhos/meter. (Author)

AD-269 215 Div. 8, 25
(TISTP/JW) OTS price $6.60

Electronics Research Lab., U. of Calif., Berkeley.
(No title).
Consolidated quarterly progress rept. no. 3.
15 Nov 61, 53p.
(Contracts AF 49(638)1043 and AF 19(604)2270)
Unclassified report

DESCRIPTORS: (*Electronic equipment, *Electronic circuits, Transistors, Amplifiers.) (Oscillators, Diodes, Parametric amplifiers, Frequency multipliers, *Microwave equipment.) (Plasma physics, Electron tubes, Wave transmission.) (Electromagnetic theory, Electromagnetic waves, Propagation, Antennas.) (Masers, Control systems, Data processing systems.)

AD-269 216 Div. 8, 25, 14
(TISTM/GEC) OTS price $9.60

Gulton Industries, Inc., Metuchen, N. J.
HIGH TEMPERATURE DIELECTRIC MATERIALS.
Final rept.,
by D. A. Lupfer. 31 Aug 61, 113p. incl. illus. tables, 4 refs.
(Contract AF 19(604)5730)
Unclassified report

DESCRIPTORS: (*Dielectrics, *Refractory materials, Ceramic materials, Capacitors, Preparation, Single crystals, *Cermets, *Thin films, Impurities.) (Magnesium compounds, Aluminum compounds, Titanium compounds, Strontium compounds, Barium compounds, Oxides.) (Processing, Pyrolysis, Electrodeposition, Evaporation.) (High temperature research, Dielectric properties.)

Techniques were developed and adapted to prepare refractory oxides, particularly single crystals, for dielectric analyses. In particular, methods of sputtering and evaporation were extended to provide heavy noble metal electrodes. The dc resistivity at elevated temperatures of MgO) single crystals was increased by the application of dc fields at temperatures from 25 to 560 C; the same was true for the ac resistivity. The effect of exposure to high temperatures alone generally lowered the resistivity. Thin films of A1203 formed anodically and heat treated, had good dielectric properties at moderate temperatures. TiO2 films prepared by the pyrolysis of TiC14 were excellent dielectrics. (Author)

AD-269 219 Div. 8
(TISTE/CRJ) OTS price $6.60

General Electric Co., Syracuse, N. Y.
INVESTIGATION OF ANTENNA BEAM SCANNING.
Final rept., 1 July 60-30 Sep 61,
by Howard Q. Totten and Robert J. Jones.
30 Sep 61, 57p. incl. illus. 4 refs.
(Contract AF 19(604)6659)
(AFCRL-902) Unclassified report

DESCRIPTORS: (*Radar antennas, Antennas, *Electronic commutators, Commutators, Reflectors, Antenna horns, Transmission lines, Focusing, Design.) (*Antenna radiation patterns, Lobing, Phase measurement, Mathematical analysis, Measurement.)

A theoretical study of the antenna configuration was made to determine: (1) design data for the Wullenweber array, and (2) design of a commutator suitable for generating the proper driving distribution. Far field contour patterns were calculated for the feed ring radii of 10, 20, 40, and 60 lambda and focal lengths of 5 and 7.5 lambda. Patterns were also calculated for the feed ring positioned off focus by 1, 2, and 3 beamwidths to determine higher angle coverage capabilities. Commutator work consisted mainly of the redesign of a previously built commutator. (Author)

AD-269 254 Div. 8, 15
(TISTP/WH) OTS price $6.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
A VARIATIONAL PRINCIPLE SIMPLIFIED,
by Charles M. McDowell. Dec 61, 62p. 12 refs.
(Rept. no. 3709-11-T)
(Contract AF 33(616)7391)
Unclassified report

DESCRIPTORS: (Electromagnetic waves, Propagation, *Scattering, Mathematical analysis.) (*Calculus of variations, Green's function, Integral equations.) Tensor analysis.

This report compiles existing material on the variational method in electromagnetic scattering problems, to present it in a form readily digested by those having reasonably good training in advanced calculus and an elementary knowledge of Maxwell's equations. The first part of the report discusses the mathematical tools needed to develop the variational formula. These are calculus of variations, Green's function for the scalar Helmholtz equation, and tensor analysis. The second part applies these ideas to derive the dyadic Green's function and an integral equation for the scattered field. From the integral equation, a stationary expression for the scattered field is derived, and the variational formula for the backscattering cross section is then obtained. (Author)

AD-269 255 Div. 8, 26
(TISTW/DLW) OTS price $8.60

Motorola, Inc., Phoenix, Ariz.
COMPATIBLE TECHNIQUES FOR INTEGRATED CIRCUITRY.
Quarterly rept. no. 2, 1 Aug-31 Oct 61.
1 Dec 61, 55p. illus. table.
(Contract AF 33(616)8276)
Unclassified report

DESCRIPTORS: (*Electronic circuits, *Thin films, Semiconductors, Amplifiers, Switching circuits, Design, Processing, *Manufacturing methods.) (Resistors, Capacitors, Tantalum capacitors, Intermetallic compounds, Crystals, Growth, Circuits.)

Investigations were continued on the development of process techniques necessary for integrated circuit fabrication. Effort was both in morphological areas and thin films as applied to semiconducting substrate. Further efforts in perfecting epitaxial techniques are reported. A program was started to develop and fabricate typical circuits practical for a wide range of high and low frequency amplifier applications as well as logic circuits. (Author)

AD-269 284 Div. 8
(TISTW/EET) OTS price $14.00

RCA Defense Electronic Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM.
Engineering analysis rept.
30 Nov 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: (*Subminiature electronic equipment for *Radio communication systems and Digital computers, *Packaging, *Packaged circuits, Processing, Production, Standards, Costs, Feasibility studies, Reliability.) (*Miniature electronic equipment, Packaging.)

Contents: Description of the program; Micro-elements; Materials, Production facilities, Military standards, Cost reduction, Packaging, Resistors, Capacitors, Inductors, Crystals, Transistors, Diodes, Micro-modules; Intermediate-frequency micro-modules, Radio-frequency micro-modules, Digital types, Subassemblies; and Equipment.

AD-269 295 Div. 8, 25
(TISTW/DLW) OTS price $2.60

Case Inst. of Tech., Cleveland, Ohio.
SURFACE CURRENT MEASUREMENTS WITH AN ELECTRIC PROBE,
by Robert Plonsey. 18 Oct 61, 24p. incl. illus. tables, 14 refs. (Scientific rept. no. 28)
(Contract AF 19(604)3887)
(AFCRL-971) Unclassified report

DESCRIPTORS: (*Electromagnetic fields, Electromagnetic waves, Diffraction, Magnetic fields, Scattering, *Electromagnetic wave reflections, Microwaves, Electric fields, Impedance, Measurement.) (*Microwave probes, Test equipment, Reflectors, X band, Errors, Test methods.)

The use of an electric probe for measurement of induced surface currents on obstacles in a parallel plate region is described. An analysis of the sources of error, and in particular the interaction of the probe with the obstacle, is examined theoretically and experimentally. It is concluded that the technique is capable of yielding measurements of good accuracy. The measured surface currents on flat and curved strips are given as examples. (Author)

AD-269 300 Div. 8, 26
(TISTE/CDM) OTS price $6.60

Space Technology Labs., Inc., Los Angeles, Calif.
SURVEY OF MICROMINIATURIZATION OF ELECTRONIC EQUIPMENT,
by P. V. Horton and T. D. Smith. 31 Dec 59, 58p. (Rept. no. STL/TR-59-0000-09957)
(Contract AF 04(647)309)
(AFBMD TR 60-57) Unclassified report

DESCRIPTORS: (*Subminiature electronic equipment, *Electronic circuits, Production, Manufacturing methods, Packaging, Packaged circuits.) (Miniature electronic equipment, *Bibliography.)

A survey was made of microminiaturization of electronic equipment. Approximately 150 firms in the electronic equipment and parts industry were found to be energetically engaged in microminiaturization research, development, and technical support. A wide variety of fabrication techniques were used, ranging from vacuum, electrical, and chemical depositing of thin films to the growing of semiconductor ribbons. Among methods used are spectrographic plates for photo resists, screen and photolithographic printing, micromachining, air abrasion, ultrasonic machining, and electronic etching. Microminiature circuits of some types are expected to be available soon for limited applications. Improved performance, resistance to environmental extremes, and increased reliability can be anticipated. Reduced size will eventually permit satellite payloads with highly sophisticated instrumentation and completely redundant control systems. (Author)

AD-269 309 Div. 8
(TISTP/TL) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
WEAK-BEAM PHASE-BRIDGE MEASUREMENT OF INTER-

ACTION IMPEDANCE.
Final rept.,
by R. P. Lagerstrom, D. A. Dunn, and P. A. Brennan. 29 July 60, 32p. incl. illus. 11 refs.
(Technical rept. no. 490-1)
(Contract Nonr-22525, Proj. NR 373-862)
Unclassified report

DESCRIPTORS: (*Electron beams, Measurement, Circuits, Impedance, *Electron guns, *Traveling wave tubes, *Backward-wave oscillators.) (Impedance bridges, Velocity, Frequency, Perturbation theory, Direct current, Magnetic fields, Modulation.) (Detectors, Interferometers, Oscilloscopes, Vaccum systems.) Tests.

A weak electron beam is operated at full circuit voltage to perturb the phase delay along a slow-wave structure. The beam current is typically on the order of one-thirtieth of Kompfner-dip current or backward-wave start-oscillation current. The phase perturbation is measured on a simple phase bridge made of ordinary standing-wave-measurement equipment. The circuit-interaction impedance is calculated from this datum. Space-charge effects can be neglected without error. Since the beam is a velocity-sensitive perturbation, it can distinguish between different space-harmonic waves, between backward and forward waves, and between modes on some multimode circuits. Circuits intended for pulsed high-power operation can be perturbed with d-c beams without exceeding their dissipation ratings. Weak-beam data are compared favorably with forward-wave and backward-wave impedance data taken by the conventional methods on a tape helix. The weak-beam data are probably more reliable because of the lack of space-charge effects. (Author)

AD-269 374 Div. 8
(TISTW/EET) OTS price $8.60

Clevite Corp., Cleveland, Ohio.
LOW FREQUENCY GYRATOR DEVELOPMENT,
by D. R. Curran, C. P. Germano and others.
15 Nov 61, 44p. illus. 10 refs. (Technical note no. 3)
(Contract AF 30(602)2202, Proj. 30201-G)
(RADC TDR 61-304) Unclassified report

DESCRIPTORS: (Electronic circuits, Electrical networks, Electromechanical converters, *Piezoelectric transducers, *Magnetostriction transducers, Band pass filters, Synthesis, Design, Tests, Theory.) (*Electronic circuits, Electrical networks, Impedance, Design.) (Waveguide couplers, Magnetic fields, Electric fields, Low frequency.) (Hall effect, Electric fields, Magnetic fields, Design.) (Piezoelectric materials, Ferrites, Broadband, Transducers.)

Electromechanical gyrators were developed over the frequency range from 375 c to 1.1 mc using coupled piezoelectric and piezomagnetic transducers in two designs. Over most of this range, bandwidths of 1 to 3.7% were obtained with power insertion losses below 2 db. Single frequency neutralization, by the addition of an inductor or capacitor, yielded isolators with 1 to 2 db power insertion loss in the pass direction and a narrow band of high rejection in the stop direction. By cascading a phase shifter with the EM gyrator and then neutralizing the combination with a parallel resistor, a stop bandwidth comparable to the gyrator pass bandwidth is obtained without adversely affecting the pass direction characteristics. Hall effect gyrators have been fabricated using indium antimonide plates with from 4 to 32 terminals. As expected, efficiency increases with increasing numbers of terminals. (Author)

AD-269 404 Div. 8, 26
(TISTW/DLW) OTS price $3.60

General Electric Co., Owensboro, Ky.
DEVELOPMENT OF AN IMPROVED JAN 6299.
Quarterly progress rept. no. 2, 1 Aug-31 Oct 61,
by Francis A. Marra. 31 Oct 61, 29p. illus.
(Contract DA 36-039-sc-85953)
Unclassified report

DESCRIPTORS: (*Electron tubes, Seals, Coatings, Design, Processing, *Manufacturing methods, Life expectancy, Humidity, Tests.)

The study to evaluate certain areas of advanced tube manufacturing techniques and to apply them where feasible to the JAN 6299 was continued. Tables are presented listing eccentricity data and humidity test results for present production tubes. A description of the proposed redesign of three seals from lead to hard solder is included. Life results of the cathode spray density evaluation are summarized. (Author)

AD-269 411 Div. 8, 20
(TISTW/DLW) OTS price $5.60

General Dynamics/Fort Worth, Tex.
IRRADIATION TESTS OF SELECTED TRANSDUCERS,
by E. W. Bradford. 15 Dec 61, 58p. incl. illus. tables, 4 refs. (Doc. no. MR-N-265; NARF-61-24T)
(Contract AF 33(657)7201)
Unclassified report

DESCRIPTORS: (*Transducers, *Piezoelectric transducers, Accelerometers, Strain gages, Thermometers, Potentiometers, Pressure gages, Instrumentation, Radiation effects, Temperature, Humidity, Radioactivity, Sensitivity, Reliability, Tests.)

A number of instrumentation transducers were irradiated for finding commercially available transducers that can be used in a radiation environment. The tests were made at ambient temperature and humidity conditions. The pickups were exercised during irradiation to simulate operating conditions. The pickups tested included differential transformers; fluid-damped and magnetic-damped velocity pickups; strain gages; piezoelectric accelerometers; bulk resistance thermometers; and inductive, strain-gage, and potentiometer pressure pickups. Potentiometer pressure pickups, magnetic-damped velocity pickups, and piezoelectric accelerometers operated satisfactorily in the radiation environment. (Author)

AD-269 412 Div. 8
(TISTW/DLW) OTS price $5.60

General Electric Co., Syracuse, N. Y.
STUDY AND INVESTIGATION OF THE APPLICATION OF SYNTHETIC MAGNETIC WHISKERS TO MICROWAVE CIRCUITS.
Final rept.
Jan 62, 52p. incl. illus. tables.
(Contract AF 30(602)2319)
(RADC TR 61-273) Unclassified report

DESCRIPTORS: (*Electronic circuits, Microwave equipment, *Limiters, *Electronic switches, Ferromagnetic materials, Electric wire, X band, Ferrites, Design, Feasibility studies.) (Amplifiers, Waveguides, *Waveguide switches, Crystal limiters, Phase shifters, Tests.)

A feasibility study was performed which showed

that ferrite whiskers could be used to limit X-band power from 0.3 watt to 5 kilowatts with spike energies which do not exceed 50 ergs. The limiter unit is extremely compact and inexpensive to manufacture. Used with a variable reactance diode limiter, the ferrite limiter is capable of protecting receiver diodes in the microwave range. The theory for a very fast variable reactance switch was developed under this contract. The results of analysis showed that an extremely fast (less than 50 nanoseconds) switching action could be obtained with ferrite material. The switch could operate at frequencies greater than 3 kMc with reasonable drive powers. Preliminary analysis of a whisker amplifier indicates that a marked improvement should result in the gain bandwidth product at reasonable pump levels over single crystal YIG types. (Author)

AD-269 417 Div. 8
(TISTE/CRJ) OTS price $4.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
APPLICATION OF P-N-P-N DIODES TO MAJORITY LOGIC CIRCUITS.
Master's thesis,
by Robert Arthur Hamann. Aug 61, 48p. incl. illus. tables, 12 refs. (Rept. no. GE/EE/61-5)
Unclassified report

DESCRIPTORS: (*Diodes, *Switching circuits, Negative resistance circuits, Electronic circuits, Semiconductors, Computer logic, Mathematical logic, Algebras, Theory, Mathematical analysis, Theses.)

The static characteristics of a two-terminal P-N-P-N diode are discussed. Switching of this diode is controlled by varying the applied voltage and current. Majority logic is then considered. Functions can be converted to majority form from Boolean expressions using an axiomatic majority-decision logic; majority logic circuits can be analyzed with Karnaugh maps. A three-input majority logic circuit using P-N-P-N diodes and passive circuit elements is presented. An analysis of the circuit shows that it is possible to obtain any number of outputs with component tolerances of 5%. The operating frequency is less than 200 kc. The circuit is practical for application where high speed is not required and diodes can be obtained at a low cost. (Author)

AD-269 427 Div. 8
(TISTE/CRJ) OTS price $11.50

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
A STUDY OF PARAMETRIC AMPLIFICATION.
Master's thesis,
by Matthew James Quinn, Jr., 30 Aug 61, 115p. incl. illus. tables, 18 refs. (Rept. no. GE-EE-61-14)
Unclassified report

DESCRIPTORS: (*Parametric amplifiers, Tuned circuits, Negative resistance circuits, Energy, Equations, Differential equations, Mathematical analysis, Theory, Theses.) (Amplifiers, Simulation, Analog computers.)

The parametric amplifier is studied beginning with several mechanical models and progressing to several parallel resonant electrical circuits. Two regenerative parametric amplifiers, the degenerate and the non-degenerate case, are analyzed by linear circuit theory and compared to the negative resistance amplifier. The Manley-Rowe energy equations are then derived by a simplified method. Finally, the degenerate case of the parametric amplifier is analyzed by the Mathieu Equation and on the analog computer. (Author)

AD-269 513 Div. 8, 14
(TISTM/TCG) OTS price $2.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION FOR THE DEVELOPMENT OF CERAMIC BODIES FOR ELECTRON TUBES,
by H. R. Wisely. 13 Dec 61, 20p. incl. tables, 10 refs. (Scientific rept. no. 5)
(Contract AF 19(604)7410)
(AFCRL-1116) Unclassified report

DESCRIPTORS: (*Electron tubes, *Ceramic materials, Alkaline earth compounds, Silicates, Synthesis, Quartz crystals, Phase transitions, Stabilization, Thermal expansion.) (Silicon compounds, Tetroxides, Calcium compounds, Barium compounds, Chemical impurities, Magnesium compounds, Boron compounds, Oxides.) (Aluminum compounds, Phosphates.)

Efforts to produce a nonabsorbent microcrystalline quartz body by high-temperature firing of Ca-doped SiO_2 that had been precalcined to develop the quartz phase failed. Compositions were formulated in which Ca_2SiO_4 was the principal phase. Means of doping the compositions to prevent body disintegration, caused by the beta to gamma inversion on cooling, were studied. The presence of sufficient MgO prevented the test discs from dusting and seemed to preserve beta-Ca_2SiO_4 to room temperature. Similar stabilization was obtained by the introduction of approximately 1 wt-% B_2O_3, or by the formation of a solid solution having a mole ratio of 1 $Ca_3(PO_4)_2$:15 Ca_2SiO_4. The 1 Ba_2SiO_4:15 Ca_2SiO_4 composition was not stabilized, but the 1 Ba_2SiO_4:7 Ca_2SiO_4 sample was very hard and did not disintegrate until bombarded by X rays. The 1 Mg_2SiO_4:7 Ca_2SiO_4 mixture produced a body that dusted on cooling and gave definite X-ray evidence that merwinite ($Ca_3MgSi_2O_8$) formed. Experiments were made to determine the suitability of $AlPO_4$ as a major phase in a ceramic body. (Author)

AD-269 521 Div. 8, 12
(TISTW/DLW) OTS price $3.60

Antenna Systems Lab., U. of New Hampshire, Durham.
RESEARCH IN SATELLITE TRACKING TECHNIQUES AND THE DEVELOPMENT OF AN INTEGRAL PARAMETRIC AMPLIFIER ANTENNA.
Final rept., 1 May 58-30 Sep 61,
by Albert D. Frost. 30 Sep 61, 30p. incl. illus. 4 refs.
(Contract AF 19(604)3892)
(AFCRL-956) Unclassified report

DESCRIPTORS: (*Parametric amplifiers, *Antenna amplifiers, *Dipole antennas, Radio receivers, Radio signals, Radio reception, Very high frequency, Design.) (*Satellite vehicles, Doppler tracking, *Tracking.) Antennas.

A summary is presented of research and development activities in connection with the improvement of reception of signals from orbiting satellites, the tracking of satellites through doppler shift measurements, and investigations leading to the invention of an integrated parametric amplifier and dipole antenna. Design conditions for the latter are summarized and the construction and performance of typical quarter and half dipoles are reported. (Author)

AD-269 522 Div. 8
(TISTE/NTM) OTS price $4.60

Electronics Research Lab., U. of Calif., Berkeley.
HIGH FREQUENCY TRANSISTOR OSCILLATORS,
by J. W. Kenny. 9 June 61, 41p. incl. illus.
(Series no. 60, Issue no. 368)
(Contract AF 49(638)1043)
(AFOSR-1749) Unclassified report

DESCRIPTORS: (*Radiofrequency oscillators, *Transistors, *Oscillator circuits, High frequency, Design.) (Oscillators, Transistor amplifiers, Phase shifters, Feedback oscillators, Mathematical analysis.)

The operation of high frequency class-C alloy junction transistor oscillators is studied by use of a simplified version of the block-diagram representation for the transistor as developed by Bruun. For the simplified version of the block-diagram representation used, unilateral operation of the transistor is assumed. Expressions approximating the transistor time delay, peak ac input voltage, and the collector current pulse cutoff time are derived by use of the block-diagram equations. An analog circuit, derived from the block-diagram equations, is used to study the class-C operation of a typical alloy junction transistor, and the results of this study are found to compare accurately with the actual transistor operation. (Author)

AD-269 567 Div. 8, 25
(TISTP/JW) OTS price $4.60

New York U. Coll. of Engineering, N. Y.
NOISE AND RANDOM PROCESSES,
by John R. Ragazzini and Sheldon S. L. Chang.
Oct 61, 35p. illus. 40 refs. (Technical rept. no. 400-40)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-1533) Unclassified report

DESCRIPTORS: (Information theory, Noise, Bibliography.) (*Noise analyzers, Feedback.) (Signals, *Static eliminators, Mathematical logic.)

The theory of noise and random processes in electronic devices was developed in two stages. The first stage spanning the two decades following 1918 brought about the understanding of the nature and effects of noise in vacuum tubes and circuits. The second stage, initiated by Wiener in the early 1940's, established the theoretical basis for synthesizing systems which optimized the transmission and detection of signals in the presence of noise. While the detailed discussion of the detection of weak signals in the presence of noise is contained in a separate paper on information theory, this subject is discussed briefly to demonstrate the similarity in the underlying concepts of optimum transmission and detection. The literature on the subject of noise and random processes is so extensive as to make complete coverage impractical. Only highlights and significant stepping stones in the development of the theory are described. (Author)

AD-269 572 Div. 8
(TISTW/DLW) OTS price $2.60

Melabs., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS.
Quarterly progress rept. no. 4, 4 July-4 Oct 61, by Roy W. Roberts, Robert R. Schell and Alfred H. Witte. 4 Oct 61, 24p. incl. illus.
(Contract DA 36-039-sc-87412)
Unclassified report

DESCRIPTORS: (*Ferromagnetic materials, Ferrites, Yttrium, Iron, *Garnet, Single crystals, Nonlinear systems, Microwave equipment, Electromagnetic properties, Measurement.) (*Microwave amplifiers, *Parametric amplifiers, *Frequency multipliers, Klystrons, Radiofrequency generators, Extremely high frequency, Design, Tests.)

Elimination of voltage breakdown within the harmonic generation circuit is discussed with the resulting effects upon applied power noted. Also described is a 70 gc power divider, a new device used as a variable, high-power attenuator in doubling experiments. Data resulting from 8 to 4 mm doubling is presented as a basis for extending present methods to klystron operation. The signal and idler resonances, of the ferrite amplifier are described as magneto-dynamic modes. Experimental verification of this description is presented. Expressions are derived which relate amplifier noise figure to the input VSWR with no pump applied. Operation of the amplifier as a lower sideband upconverter is reported. Construction of a new amplifier configuration is described. (Author)

AD-269 602 Div. 8, 7, 14
(TISTP/JW) OTS price $1.60

Westinghouse Electric Corp., Baltimore, Md.
ELECTROLUMINESCENT FERROELECTRIC(ELF) SOLID STATE DISPLAY.
Quarterly interim development rept. no. 14, 1 Sep-31 Nov 61.
31 Nov 61, 15p. incl. illus.
(Contract NObsr-72782)
Unclassified report

DESCRIPTORS: (*Display systems, Solid state physics, Luminescence, *Luminescent materials.) (Films, *Electronic switches, Cadmium compounds, Sulfides.) (Ionic current, Electronic switches, Silicones.) Ferroelectric materials.

Contents:
Materials research
Electroluminescence
Ferroelectrics
Laminar screen development
Model fabrication
Signal distribution
Ionic switch material distribution
Ionic switch operating life
Ionic switch encapsulation

AD-269 608 Div. 8
(TISTW/DLW) OTS price $6.60

Micromega Corp., Venice, Calif.
C-BAND, WIDEBAND SOLID STATE AMPLIFIER.
Quarterly technical note no. 1,
by Conrad E. Nelson. 15 Sep 61, 48p. illus.
19 refs.
(Contract AF 30(602)2525, Proj. 5573)
(RADC TR 61-279) Unclassified report

DESCRIPTORS: (*Parametric amplifiers, Microwave amplifiers, C band, Broadband, Solid state physics, Diodes, Tuning circuits, Electronic circuits, Theory, Design, Noise (Radar), Measurement.) Amplifiers.

Research is concerned with the development of a straight through low noise amplifier, electronically tunable from 4000 to 6000 kmc. Pertinent literature is reviewed and a theoretical foundation for subsequent experimental and theoretical work established. Upper bounds for practically realizable signal, idler, and pump bandwidths are determined. It is shown that even with an infinite number of tuned sections, the bandwidth of each circuit is ultimately limited by the electrical characteristics and parasitic elements of the varactor diode. Noise Figure limitations with presently available diodes are reviewed and the proper pump frequency is approximately determined. (Author)

AD-269 625 Div. 8
(TISTP/TL) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A GAS-DISCHARGE STABILIZER,
by A. M. Rezikyan, Yu. G. Agbalyan, and K. A. Madatyan. 7 Aug 61, 5p. incl. illus. tables, 2 refs. (Trans. no. MCL-1063/1 of Izvestiya Akademii Nauk Armyanskoy SSSR, Seriya Fiziko-Matematicheskiky Nauk 13:65-68, 1960)
Unclassified report

DESCRIPTORS: (*Gas discharges, Stabilization systems, Stabilization, Glow discharges, *Discharge tubes, Magnetic fields, Gas ionization.) (Measurement, Theory, Anodes, Electrodes, Direct current, Argon, Hydrogen.) Rectifiers, USSR.

A gas-discharge tube is placed in a solenoid connected in series with the discharge gas. The axis of the tube is parallel to the magnetic lines of force. In the anode-cathode discharge gap the charges move spirally, i.e., they have a tangential velocity component. Under the effect of this component, the gas in the tube begins to rotate. With an increase in the discharge current, the magnitude of the magnetic field increases, the trajectory of the charge is involuted, and as a result of the increase in the length of the trajectory and, consequently, the internal resistance of the gap, the current decreases. With a decrease in current the entire process reverses. (Author)

AD-269 633 Div. 8
(TISTW/DLW) OTS price $1.10

Foreign Tech. Div., Air Force Systems, Command, Wright-Patterson Air Force Base, Ohio.
TEMPERATURE REGULATOR OF A GYROSCOPIC INSTRUMENT (Regulyator Temperaturi Giropriladu),
by G. K. Nechayev and S. R. Raykhman.
18 July 61, 7p. incl. illus. table (Trans. no. MCL-1194/1 of Avtomatika 3:70-75, 1960)
Unclassified report

DESCRIPTORS: (*Gyroscopes, Temperature sensitive elements, *Temperature control, *Thermostats, Electronic circuits, Stability, Design, USSR.)

The accuracy of any kind of gyroscopic instrument depends to a large extent upon the stability of its temperature. Maintaining a constant temperature with an accuracy of up to 0.1 C and over is possible by placing the instrument in a thermostat or by employing automatic temperature control. (Author)

AD-269 634 Div. 8, 25
(TISTP/TL) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A STUDY OF THE TIME RESOLUTION OF PHOTOMULTIPLIERS USING THE OSCILLOGRAPHIC METHOD,
by A. G. Berkovskiy and V. G. Pol'skiy.
17 Aug 61, 6p. incl. illus. 1 ref. (Trans. no. MCL-1197/1 of Radiotekhnika I Elektronika 5:1475-1477, 1960)
Unclassified report

DESCRIPTORS: (*Photomultipliers, *Time, Measurement, *Oscillographs, Circuits.) (Anodes, Cathodes, Light pulses, Photoelectrons, Electric discharge, Sparks.) USSR.

A description is given for measuring the time resolution of photomultipliers using a high speed oscillograph and periodic light flashes of nanosecond duration. The results of measuring the time parameters of the group of photomultipliers are given. (Author)

AD-269 655 Div. 8, 19
(TISTP/RD) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SHIELDING A GRYOSTABILIZER WHICH IS A SOURCE OF ELECTROMAGNETIC INTERFERENCE,
by Ye. I. Shelepin, K. M. Sobolevskiy, and V. S. Baranetskiy. 17 Aug 61, 9p. incl. illus. tables, 3 refs. (Trans. no. MCL-1304/1 of Avtomaticheskiy Kontrol' I Izmeritel'naya Tekhnika 4:102-108, 1960)
Unclassified report

DESCRIPTORS: (*Shielding of *Gyro stabilizers.) (Shielding against Electromagnetic waves, *Interference from Gyro stabilizers.) USSR.

AD-269 660 Div. 8
(TISTW/DLW) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
ELECTRONIC TUBE TECHNOLOGY-MICROWAVE TUBES.
Interim engineering rept. no. 2, 1 Sep-30 Nov 61, by Dean T. Davis. 8 Dec 61, 10p. incl. illus. (Contract AF 33(616)8391)
Unclassified report

DESCRIPTORS: (*Frequency multipliers, *Electron tubes, Microwave equipment, Electron beams, Electron guns, Waveguides, Microwaves, Radiofrequency generators, Design, Tests.)

Research was continued on the use of fast cyclotron waves to produce frequency multiplication in an output coupler. An attempt was made to improve the performance of the multiplier by increasing the perveance of the electron beam. The Heil electron gun has shown good characteristics in high perveance operation, so a standard Heil gun with a .010 in. anode aperture was placed in a magnetic shield. The performance of this gun was encouraging, as a beam current of 7.5 milliamperes was obtained at 350 volts. This is an increase of 2.8 times in beam conductance, which should increase the output power by the same factor, and the overall conversion efficiency should increase approximately by a factor of 8. (Author)

AD-269 678 Div. 8
(TISTW/DLW) OTS price $2.60

Loral Electronics Corp., New York.
TEST HARNESS, DISPLAY-PLOTTING BOARDGROUP AN/USM-138 FOR DISPLAY-PLOTTING BOARD GROUP OA-1768/ASA-13.
Final engineering rept.
14 Apr 61, 17p. incl. illus. tables.
(Contract NOa(s) 58-736-r)
Unclassified report

DESCRIPTORS: (*Plotting boards, *Maintenance equipment, Test equipment, Display systems, Electronic equipment, *Test sets, Design.)

Test harness, display-plotting board group AN/USM-138 permits maintenance personnel to efficiently test and troubleshoot the display-plotting board group OA-1768/ASA-13. The specific items included in the equipment and their proper use and interconnections are discussed. Methods of use are shown for system tests, bench tests, and troubleshooting. (Author)

AD-269 701 Div. 8, 26
(TISTW/DLW) OTS price $1.50

Raytheon Co., Burlington, Mass.
HIGH TEMPERATURE MICROWAVE TUBE DESIGN AND PROCESSING.
Rept. for 1 July 60-30 Apr 61 on Phase 2,
by Raymond J. Dyer. Oct 61, 55p. incl. illus.
(Contract AF 33(616)7394, Proj. 4156)
(ASD TR 61-316) Unclassified report

DESCRIPTORS: (*Electron tubes, *Microwave equipment, High temperature research, Design, Manufacturing methods.) (*Magnetrons, Waveguide windows, Refractory materials, Processing, Life expectancy, Tests.)

Investigations of factors which would permit long-life operation of microwave tubes at an ambient temperature of 350 C were carried out. The RK6249, a magnetron in high usage and considered of typical construction, was selected as the test vehicle. Ceramic-to-metal seal assemblies were designed to replace the glass bushings and the glass output window. A window assembly to view cathode operating temperature was designed. Work was conducted to provide for high temperature oxidation protection of the tube at high ambient temperature in air. The test vehicles constructed were life tested at 250 and 400 C for several hundred hours. Scrap analysis was performed to determine the cause of tube failure and the effect of high temperature operation on tube components. Materials and processing investigations were carried out during a parallel effort in which a suitable replacement for copper was found. The removal of carbon monoxide from stainless steel, Kovar and nickel was studied. (Author)

AD-269 738 Div. 8, 25
(TISTM/EJH) OTS price $1.60

Shockley Transistor Corp., Palo Alto, Calif.
FAILURE MECHANISMS IN SILICON SEMICONDUCTORS.
Quarterly status rept. no. 1, 1 July-30 Sep 61,
by Hans J. Queisser. 30 Sep 61, 13p. illus.
2 refs.
(Contract AF 30(602)2256)
(RADC TR 61-277) Unclassified report

DESCRIPTORS: (*Silicon, *Semiconductors, Diodes, Single crystals, Crystals, Crystal structure, Growth, Preparation, Diffusion, Chemical impurities, Gallium, Indium, Aluminum, Failure (Mechanics), Electrical properties.) (Microscopy, Electron microscopes.)

This report includes:
STACKING FAULTS IN EPITAXIAL SILICON,
by H. J. Queisser, R. H. Finch and J. Washburn.
1961,
(In cooperation with Lawrence Radiation Lab., U. of California, Berkeley)

Diffusion studies on small angle grain boundaries in Si were performed with the dopants Ga, In, and Al to investigate the influence of dislocations on the behavior of diffused Si devices. A mathematical treatment of diffusion along isolated dislocations is being explored. The electrical behavior of devices with a small angle boundary was studied. Twin boundaries were investigated; an adverse effect upon diode reverse characteristics was found only for incoherent twin boundaries. Defects in epitaxial layers were studied extensively. Slices of less than 1 micron thickness were fabricated; the transparency of these slices allows direct observation of defects with optical and electron transmission microscopy. Stacking faults were detected for the first time in Si.

AD-269 770 Div. 8
(TISTW/DLW) OTS price $2.60

Union Thermoelectric Div., Comptometer Corp., Niles, Ill.
THE DESIGN OF FUNDAMENTAL MODE MILITARY QUARTZ RESONATORS FOR THE HC-18/U HOLDER 3 TO 12 MC.
Rept. for 1 Mar 60-28 Feb 61,
by Len A. Tyler. Aug 61, 21p. incl. illus. tables.
(Contract DA 36-039-sc-71061)
Unclassified report

DESCRIPTORS: (*Quartz resonators, Quartz crystals, High frequency, Crystal holders, Crystals, Production, Design, Tests.)

General design and production data are presented for fundamental mode resonators in the 3 to 12 mc range which are to be mounted in the HC-18/U type holder. Two plate configurations were investigated: plane-parallel, and plano-convex. Satisfactory results were obtained with plane-parallel plates at frequencies down to 9 mc, and with plano-convex plates down to 3.5 mc. Below 3.5 mc, the results with plano-convex plates were marginal. (Author)

AD-269 780 Div. 8
(TISTW/DLW) OTS price $1.60

Watkins-Johnson Co., Palo Alto, Calif.
DEVELOPMENT OF AN E-BAND AMPLIFIER.
Quarterly rept. no. 3, 1 Aug-30 Sep 61,
by E. W. Kinaman. 30 Sep 61, 16p. incl. illus.
(Technical note no. 3)
(Contract AF 30(602)2422, Proj. 5573)
(RADC TDR 61-297) Unclassified report

DESCRIPTORS: (*Microwave amplifiers, Extremely high frequency, Yttrium compounds, Iron compounds, Garnet, *Traveling wave tubes, *Bandpass filters, Tuning devices, Waveguide filters, Magnets, Test equipment, Noise (Radio), Reduction, Design.)

Progress is reported on the electrically-tunable filter, the permanent magnet, and important test equipment. Two tubes are under fabrication. The first tube reached the final alignment stage, prior to glassing and exhaust and the second tube approached the matching stage. The prototype filter had most encouraging initial tests. Performance over the full band was achieved with instantaneous bandwidths of 30-80 mc at 6-8 db resonance insertion loss. A flexible dielectric waveguide was fabricated and utilized in the filter measurements. Initial set-up on the receiver (for loss and noise figure measurements) is discussed. (Author)

AD-269 804 Div. 8
(TISTB/RD) OTS price $2.60

Material Lab., New York Naval Shipyard, Brooklyn.
RELIABILITY STUDY FOR HIGH POWER TRANSISTORS.
Progress rept. no. 3, on Phase 1.
23 Jan 62, 10p. illus. tables (Lab. proj. no. 5032-B-28.27)
Unclassified report

DESCRIPTORS: (*Transistors, *Reliability, Life expectancy, Tests, Test methods, Test equipment.)

AD-269 811 Div. 8, 19
(TISTW/DLW) OTS price $5.60

Automation Dynamics Corp., Tenafly, N. J.
ANTENNA - AT-601(XE-3)/TRN.
Final rept., 27 Feb-21 July 61,
by Robert A. McCown and Sydney R. Parker.
21 July 61, 53p. incl. illus.
(Contract DA 36-039-sc-87265)
Unclassified report

DESCRIPTORS: (*Radio beacons, *Antennas, Antenna hardware, Antenna masts, Mobile, Transmission lines, Glass textiles, Design, Antenna radiation patterns, Standing wave ratios, Tests, Radio navigation.)

The development and final design efforts are discussed of a prototype model of the AT-601 (XE-3)/TRN antenna for the radio beacon system AN/TRN-9. Detailed consideration is given to: (1) the electrical design of the radiation and feed circuits for the antenna cone and fan arrays, (2) matching technique for obtaining 1.2 VSWR, (3) evaluation of the necessity of a ground plane and the final choice of ground plane material, (4) mechanical redesign to obtain a rugged, portable, and easily assembled unit, (5) the choice of the radiation element material and the means for radiation element quick disconnect, (6) radiation pattern measurements, (7) flight test measurement on the antenna, and (8) environmental testing. (Author)

AD-269 842 Div. 8, 15
(TISTP/MFA) OTS price $2.60

Friedman, Morris D., West Newton, Mass.
ON FINDING ASYMPTOTES OF SOLUTIONS OF SHORTWAVE DIFFRACTION PROBLEMS,
by A. IA. Povzner and I. V. Sukharevskii.
Aug 61, 27p. (Scientific rept. no. 52; Trans. of Zh Vychisl. Mate Mate. Fiz. 1:224-245, 1961)
(Contract AF 19(604)5969)
(AFCRL-759)
Unclassified report

DESCRIPTORS: (*Algebraic topology, *Very high frequency, *Diffraction, Acoustics, *Electromagnetic waves.) (Matrix algebra, Transformations (Mathematics), Partial differential equations.) USSR.

Let a source be placed at the point a which completely illuminates the surface S (this means that none of the rays leaving a is tangent to the surface S) and which we shall assume has no edges and goes to infinity. The problem is to find asymptotes of the diaphragmed field for shortwaves in the case of a perfectly reflecting surface S. We shall assume the surface S to be analytic in the neighborhood of each of its points. This restriction can be replaced by the requirement of differentiability to a sufficiently high order if it is necessary to find only a finite number of terms of the asymptotic series. We shall start with an analysis of the scalar acoustic problem and then we shall transfer the results obtained to the case of the Maxwell equations. (Author)

AD-269 844 Div. 8
(TISTE/MS) OTS price $3.60

Electronic Research Lab., U. of Calif., Berkeley.
ANALYSIS OF AN INTEGRATED BISTABLE MULTIVIBRATOR.
Rept. on Integrated Circuits,
by L. O. Hill. 29 May 61, 33p. incl. illus.
3 refs. (Series no. 60, Issue no. 359)
(Contract AF 33(616)7553, Proj. 4159)
(ASD TN 61-113)
Unclassified report

DESCRIPTORS: (*Vibrators, *Circuits, Semiconductors, Capacitors, Transistors, Design.)

A typical realization of an integrated bistable

multivibrator is proposed and analyzed. It is found that the integrated realization is slower than its lumped counterpart. This decreased speed of operation results (a) from excess minority carrier storage in the bulk semiconductor material which forms the transistor collector regions and circuit resistances, and (b) from the voltage dependence of the large area p-n junctions which form the cross coupling networks. (Author)

AD-269 846 Div. 8
(TISTW/DLW) OTS price $8.10

Electronic Defense Labs., Mountain View, Calif.
TUNNEL DIODE CIRCUITS AT MICROWAVE FREQUENCIES,
by John Reindel. 15 Aug 61, 76p. incl. illus. table, 35 refs. (Technical memo. no. EDL-M397)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: (*Electronic circuits, *Diodes, *Microwave amplifiers, Miniature electronic equipment, Broadband, *Microwave oscillators, Crystal mixers, Frequency stabilizers, Transmission lines, Tuning circuits, Amplifiers, Very high frequency, L band, C band, S band, Design, Noise (Radio), Effectiveness, Tests.)

Results are presented of recent studies in tunnel diode microwave circuits at the Electronic Defense Laboratories. Descriptions are also offered of an S-band low-noise amplifier with a voltage gain bandwidth product of 6000 mc and of designs of mechanically tunable down converters. The prime features of the tunnel diode, its small size and low dc power requirements, are taken advantage of in the circuit designs. (Author)

AD-269 848 Div. 8
(TISTP/TL) OTS price $3.60

Electronic Communications, Inc., Timonium, Md.
MILIMETER WAVE RESEARCH,
by M. Cohn, J. M. Cotton, and F. Sobel.
30 Nov 61, 31p. incl. illus. tables, 12 refs.
(Technical note no. 2)
(Contract AF 30(602)2457, Proj. 4506)
(RADC TDR 61-240) Unclassified report

DESCRIPTORS: (*Microwaves, Analysis, Wave transmission, Waveguides, Electromagnetic waves, Spectrographic analysis, Reflection, Measurement.) (Optics, Polarization.) (Instrumentation, Sheets, Radio frequency filters, Electric filters, Antennas, Harmonic analysis, Detectors, Power supplies.)

Analyses are being continued for a variety of transmission methods and associated components for possible utilization in the 1.0 to 0.1 millimeter wavelength region of the electromagnetic spectrum. Efforts are being made to assemble instrumentation such that confirming measurements can be made in this region. The report includes an extension of the analysis of Fresnel zone plates presented in the preceding report. The report also includes a description of the proposed measurement arrangement and details of the components. (Author)

AD-269 851 Div. 8, 26
(TISTW/DLW) OTS price $4.60

GB Electronics Corp., Garden City, N. Y.
DEVELOPMENTAL PROGRAM FOR DETERMINATION OF SUITABLE MATERIALS AND TECHNIQUES FOR FABRICATING SPECIAL WAVEGUIDE ASSEMBLIES.
Interim development rept., Apr-Aug 61.
23 Aug 61, 23p. illus.
(Contract NObsr-85320, Proj. SR-0080302)
Unclassified report

DESCRIPTORS: (*Waveguides, Waveguide joints, Waveguide bends, Chemical milling, Electron beams, Welding, Dielectrics, Brazing, Machining, Bonding, Flame spraying, Foamed metals, Extrusion, Sandwich construction, Processing, *Aluminum, Design, *Manufacturing methods, Tests.)

Investigations were made of various materials and techniques for fabricating a lightweight serpentine waveguide. Details of the various techniques, methods, and materials investigated are discussed. The various techniques and methods that were investigated are: (1) lightweight waveguide using conventional techniques, (2) chemical milling, (3) metal spraying, (4) waveguide formed by conductive epoxy and aluminum sheet, (5) electron-beam welding of sheet aluminum, (6) light gauge extrusions, (7) slotting method, (8) foam sandwich panels, and (9) dielectric filled waveguide. (Author)

AD-269 853 Div. 8, 14
(TISTA/VGW) OTS price $1.60

Brunswick Corp., Marion, Va.
RADOME MODEL 128B10005.
Quarterly progress rept. no. 11, 1 Aug-31 Oct 61, by H. L. Huff. 7 Dec 61, 17p. (Rept. nos. 1260EE and 1260FF)
(Subcontract to Grumman Aircraft Engineering Corp., Bethpage, N. Y., Contract NOa(s) 58-524-c)
Unclassified report

DESCRIPTORS: (*Radomes of Epoxy resins, Plastics, Design, Processing.)

This report includes:
Brunswick Corp., Marion, Va.
GRUMMAN DESIGN 128. Monthly progress rept. 1-31 Aug 61, by H. L. Huff. (BC rept. no. 1260-EE)
(Subcontract to Grumman Aircraft Engineering Corp., Bethpage, N. Y., Contract NOa(s) 58-524-c)

Brunswick Corp., Marion, Va.
GRUMMAN DESIGN 128. Monthly progress rept., 1 Sep-31 Oct 61, by H. L. Huff. (BC rept. no. 1260-FF)
(Subcontract to Grumman Aircraft Engineering Corp., Bethpage, N. Y., Contract NOa(s) 58-524-c)

AD-269 874 Div. 8
(TISTP/FR) OTS price $1.10

Israel Inst. of Tech., Haifa.
SOLID STATE LOGARITHMIC PULSE AMPLIFIER,
by David Ophir and Uzia Galil. Apr 61, 6p. illus. 3 refs. (Technical note no. 2)
(Contract AF 61(052)196)
(AFCRL-853) Unclassified report

DESCRIPTORS: (Transistor amplifiers, *Pulse amplifiers with Diodes.) (*Photomultipliers, Circuits.)

The use of a zener diode as the logarithmic element in pulse logarithmic amplification is described. A specific three decade pulse logarithmic amplifier using the zener diode and transistorized circuit is presented. (Author)

AD-269 876 Div. 8
(TISTP/TL) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
MEASUREMENT OF DIELECTRIC CONSTANT BY USING A RADIAL WAVEGUIDE.
Master's thesis,
by James Gerald Klaus, Jr. Aug 61, 58p. incl. illus. tables, 10 refs. (Rept. no. GE/EE/61-10)
Unclassified report

DESCRIPTORS: (*Dielectrics, Materials, Microwaves, Measurement, *Waveguides.) (High temperature research, Metals, Electromagnetic fields, Electromagnetic properties, Impedance, Electromagnetic theory, Electromagnetic waves, Propagation.) (Partial differential equations, Wave analysis, Matrix algebra, Functions.)

A method for measuring permittivity, epsilon, is derived from the equations of the fields in a shorted radial wave guide obtained from the Maxwell equations. The method is checked by measuring epsilon r(1), the relative dielectric constant, and tan delta, the loss tangent, for three samples by measuring in a radial slot in the guide, the wave length and the VSWR at one minimum of known distance from the short at room temperature and at a frequency of 9375 mc/s. The method shows promise of measuring epsilon r(1) at frequencies as high as k band and at high temperatures limited only by the metal used in the guide itself. (Author)

AD-269 880 Div. 8, 4, 14
(TISTM/GEC) OTS price $1.10

CBS Labs., Stamford, Conn.
RESEARCH AND INVESTIGATION ON PHOSPHOR SCREENS FOR HIGH RESOLUTION DISPLAY DEVICES.
Interim engineering rept. no. 2, 1 Sep-31 Dec 61, by R. E. Rutherford, Jr. 23 Jan 62, 4p. illus. (Contract AF 33(616)8509)
Unclassified report

DESCRIPTORS: (*Display systems, *Cathode ray tube screens, *Fluorescent screens, *Phosphors, Preparation, Measurement.) (Electrodeposition, Coatings, Tin compounds, Oxides, Bismuth compounds, Gold compounds, Tin alloys, Zinc alloys, Glass.)

Research and investigation on phosphor screens to improve their information transfer capacity continued. Improvements in phosphor screen formation by the electrodeposition technique were studied. Preliminary results on the measurement of the dynamic range of phosphor screen performance are indicated. (Author)

9. FLUID MECHANICS

AD-269 017 Div. 9
(TISTE/NTM) OTS price $5.60

Dynamic Developments, Inc., Long Island, N. Y.
PENDULUM TESTS OF TWO CRUISE FOILS AND VARIOUS STRUTS,
by Thomas M. Andrews. Oct 61, 49p. incl. illus., 5 refs.
(Contract Nonr-285200)
Unclassified report

DESCRIPTORS: (*Hydrofoils, Design, Parabolic bodies, Lift, Drag, Cavitation, Split flaps, Flaps, Water tunnels, Tests, Model tests, Test equipment, Test methods, *Hydrodynamics, Structures.)

Research is presented on supercavitating hydrofoil designs. Tests of various hydrofoils and struts are presented. A cambered parabolic and a thin delta foil were tested. Lift, drag and pitching moment data were recorded. The thin delta foil was tested at both high and low cavitation numbers and the cambered parabolic foil was tested with various flap designs. Another phase of testing included studies of parabolic forebody struts with and without tapered afterbodies. In all, 6 different struts were tested. One parabolic strut was tested with air blown from its base. (Author)

AD-269 082 Div. 9, 1, 30
(TISTA/WAW) OTS price $3.50

National Aeronautics and Space Administration, Washington, D. C.
TABLES OF INTERFERENCE FACTORS FOR USE IN WIND-TUNNEL AND GROUND-EFFECT CALCULATIONS FOR VTOL-STOL AIRCRAFT. PART I - WIND TUNNELS HAVING WIDTH-HEIGHT RATIO OF 2.0,
by Harry H. Heyson. Jan 62, 208p. incl. illus. tables, 6 refs. (NASA Technical note D-933)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-933.

DESCRIPTORS: (*Vertical take-off planes, *Short take-off planes, Wind tunnel models, *Wind tunnels, Configuration, Ground effect, Interference, Aerodynamics, Mathematical analysis, Tables.)

Tables of interference factors for use in wind-tunnel and ground-effect calculations for VTOL-STOL aircraft are presented for wind tunnels having a width-height ratio of 2.0. These tables were machine-calculated and are intended for use with the procedures of NASA Technical Report R-124. These tables are presented without comment. (Author)

AD-269 091 Div. 9, 1, 30
(TISTA/WAW) OTS price $3.50

National Aeronautics and Space Administration, Washington, D. C.
TABLES OF INTERFERENCE FACTORS FOR USE IN WIND-TUNNEL AND GROUND-EFFECT CALCULATIONS FOR VTOL-STOL AIRCRAFT. PART II - WIND TUNNELS HAVING WIDTH-HEIGHT RATIO OF 1.5,
by Harry H. Heyson. Jan 62. 201p. incl. illus. tables, 5 refs. (NASA Technical note D-934)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-934.

DESCRIPTORS: (*Vertical take-off planes, *Short take-off planes, Wind tunnel models, *Wind tunnels, Configuration, Ground effect, Interference, Aerodynamics, Mathematical analysis, Tables.)

Tables of interference factors for use in wind-tunnel and ground-effect calculations for VTOL-STOL aircraft are presented for wind tunnels having a width-height ratio of 1.5. These tables were machine-calculated and are intended for use with the procedures of NASA Technical Report R-124. These tables are presented without comment. (Author)

AD-269 141 Div. 9, 15
(TISTP/MFA) OTS price $1.60

Yeshiva U., New York.
INVESTIGATION OF A VARIATIONAL PRINCIPLE FOR OPEN SYSTEMS,
by J. L. Lebowitz and E. Morris. 1961, 14p. 12 refs.
(Contract AF 49(638)753)
(AFOSR-1619) Unclassified report

DESCRIPTORS: (*Fluid flow, *Heat transfer, Hydrodynamics, Thermodynamics, Energy, Chemical equilibrium, Entropy, Thermal conductivity, Particles, Transport properties.) (*Calculus of variations, Partial differential equations, Tensor analysis.)

An attempt to obtain information about the stationary nonequilibrium state of a fluid through which heat is flowing is described. The fluid is in contact with several heat reservoirs at different temperatures and is assumed to be described by an ensemble density which satisfies a generalized Liouville equation. Our method consists of minimizing a positive functional which vanishes only when the correct stationary space distribution is assumed. (Author)

AD-269 142 Div. 9, 15, 25
(TISTP/TL) OTS price $1.60

Yeshiva U., New York.
FINAL REPORT 1 OCTOBER 1959 - 1 OCTOBER 1961,
by J. L. Lebowitz. Nov 61, 10p. 14 refs.
(Contract AF 49(638)753)
Unclassified report

DESCRIPTORS: (*Quantum statistics, *Fluids, *Fluid mechanics, Thermodynamics, *Gases, *Molecules, *Particles, Kinetic theory.) (Temperature, Transport properties, Metals, Sheets.) (Distribution theory, Statistical functions, Statistical distributions, Partial differential equations, Integration, Vector analysis, Taylor's series, Matrix algebra, Probability.)

This work is in the field of Statistical Mechanics. The goal of statistical mechanics is to predict the observed properties of macroscopic objects from the properties of the atoms making up these objects. This includes such diverse problems as change of pressure with temperature, the amount of heat transported by a metal bar whose ends are kept at different temperatures, and the rate at which a liquid will flow through a channel. (Author)

Division 9 - FLUID MECHANICS

AD-269 159 Div. 9, 27
(TISTP/WH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE INFLUENCE OF THE TEMPERATURE OF A LIQUID ON THE CAVITATION CHARACTERISTICS OF A CENTRIFUGAL PUMP,
by M. A. Peshkin. 15 Dec 61, 10p. illus. 3 refs (Trans. no. FTD-TT-61-52 of Teploenergetika 2:47-51, Feb 58)

Unclassified report

DESCRIPTORS: (*Centrifugal pumps, Liquids, *Cavitation, Water, Kerosene.) (Cavitation, Heat, Temperature.) USSR.

The results are discussed of an experimental investigation of the influence of the temperature of kerosene and water on the cavitation characteristics of a centrifugal pump. (Author)

AD-269 192 Div. 9
(TISTP/TL) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE MAGNUS FORCE ON A ROTATING CYLINDER IN TRANSONIC CROSS FLOWS,
by A. S. Platou. Sep 61, 37p. incl. illus. 4 refs. (BRL rept. no. 1150)
(DA Proj. no. 503-03-009)

Unclassified report

DESCRIPTORS: (Cylindrical bodies, Bodies of revolution, *Transonic flow, *Supersonic flow, *Ballistics, *Aerodynamics, Lift, Drag.) (Angle of attack indicators, Laminar boundary layer, Turbulent boundary layer, Wake, Velocity, Density, Spark shadowgraph photography.) (Wind tunnels, Wind tunnel models, Tests.)

This analysis presents Magnus and drag data on a rotating cylinder mounted perpendicular to various transonic and supersonic flow fields. Data with both laminar and turbulent boundary layers are presented. The Magnus force data from the cylinder are compared with Magnus force data from various bodies of revolution at high angles of attack. There is good agreement as long as the body of revolution cross Mach number is transonic. The Magnus force is very much dependent on the cross Mach number at the transonic cross flows. At transonic cross Mach numbers it is possible to predict the Magnus force on a body of revolution by using the presented cylinder data. (Author)

AD-269 247 Div. 9, 25
(TISTP/JW) OTS price $3.60

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
GYRO TEMPERATURE CONTROL WITH A LIQUID SOURCE,
by R. E. Marshall and R. M. Jansson. Mar 60, 34p. incl. illus. tables, 6 refs. (Rept. no. E-906)
(Contract AF 04(647)303)

Unclassified report

DESCRIPTORS: (Liquids, Heat transfer, *Gimbals, Temperature control, *Gyroscopes.) (Boundary layer, Fluid flow, Heat, Heat transfer, Test methods.)

The thermal and fluid conditions that exist in the test gimbal and fluid jacket are described. Fluid flow rates in the fluid jacket closely govern the gyro heat transfer performance and improvements in this flow rate will substantially raise this performance. Coupled to this is the close attention that must be paid to all heat transfer parameters about the Test Gimbal, evidenced by the changes in the surrounding insulation. Several improvements are needed to yield test conditions that fully simulate system conditions. Notable ambient sensitivities are still present in the test unit. Fluid temperature loss-gain profiles, shows that the thermal conduction losses of the gyro mountings are great enough to prevent any fluid temperature gain with power on. This situation can be corrected by installing small auxiliary heaters on the gyro mounting blocks to make up for these conduction losses. The second correctable condition involves the temperature controller sensitivities and time constants. Experience has shown that these factors are not in line with similar types of control units. Only with a precise description of all the thermal conditions in both the laboratory test unit and the system can the required accuracies of gyro instruments be realized in operational systems. (Author)

AD-269 260 Div. 9, 25
(TISTP/MFA) OTS price $4.60

St. Anthony Falls Hydraulic Lab., U. of Minn., Minneapolis.
EXPERIMENTAL STUDIES OF CAVITATION NOISE IN A FREE-JET TUNNEL,
by C. S. Song and E. Silberman. July 61, 41p. incl. illus. tables (Technical paper no. 33, Series B)

Unclassified report

DESCRIPTORS: (*Cavitation noise, Acoustics, *Cavitation, Jets, *Water tunnels, Gases.) (Test equipment, Cylindrical bodies, Crystals, Barium compounds, Titanates, Transducers, Oscillographs, Ultrasonic spectrum analyzers, Cathode ray tube screens.) (Physical properties, Velocity, Pressure, Temperature.) (Harmonic analysis, Experimental data.)

The results of experimental studies on cavitation noise generated in the free-jet tunnel at St. Anthony Falls Hydraulic Laboratory in the period October 1960 to June 1961 are summarized. Two-dimensional test bodies of different shapes, such as a circular cylinder, wedge, and a Tulin-Burkhart hydrofoil were tested. Various types of cavitating flows, namely, transient cavities, steady-state cavities, and non-stationary cavities were covered. Special attention was given to the effect of ventilation on the intensity of cavitation noise. Effects of body size and the presence of a solid boundary were also investigated. (Author)

AD-269 271 Div. 9, 1, 30
(TISTA/WAW) OTS price $3.50

National Aeronautics and Space Administration, Washington, D. C.
TABLES OF INTERFERENCE FACTORS FOR USE IN WIND-TUNNEL AND GROUND-EFFECT CALCULATIONS FOR VTOL-STOL AIRCRAFT, PART III. WIND TUNNELS HAVING WIDTH-HEIGHT RATIO OF 1.0,
by Harry H. Heyson. Jan 62, 202p. incl. tables, 5 refs. (NASA Technical note D-935)

Unclassified report

Also available for NASA, Wash. 25, D. C., as NASA Technical note D-935.

DESCRIPTORS: (*Vertical take-off planes, *Short take-off planes, Wind tunnel models, Aerodynamics, Ground effect, Wind tunnels, Configuration, Interference, Mathematical analysis, Tables.)

Tables of interference factors for use in wind-tunnel and ground-effect calculations for VTOL-STOL aircraft are presented for wind tunnels having a width-height ratio of 1.0. These tables were machine-calculated and are intended for use with the procedures of NASA Technical Report R-124. These tables are presented without comment. (Author)

AD-269 285 Div. 9, 25
(TISTP/WH) OTS price $6.60

RAND Corp., Santa Monica, Calif.
THEORY OF IONIZED TRAILS FOR BODIES AT HYPERSONIC SPEEDS,
by P. S. Lykoudis. 29 May 61, rev. 5 Oct 61, 62p. incl. illus. 26 refs. (Research memo. no. RM-2682-1-PR, rev. of Research memo. no. RM-2682, AD-257 938)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: (*Condensation trails, Bodies of revolution, *Hypersonics.) (Aerodynamic configurations, Thermodynamics, *Gas ionization, Velocity, Enthalpy.) (*Re-entry aerodynamics, Heat transfer, Thermal conductivity.)

The characteristics of the gaseous trail remaining behind a body moving through the atmosphere at hypersonic speeds are discussed. Means are sought for ascertaining those variables that can be measured and used to predict the characteristics of the body causing the trail. The available theoretical and experimental literature is reviewed and the basic aspects of hypersonic trails are presented. In the case of thermodynamic equilibrium, a universal solution is found for the velocity and enthalpy distributions at a station behind the body where the pressure has reached its ambient free-stream value. The thermal-conduction part of the trail is also studied. An analytic solution is found for the case of variable thermal conductivity. The length of the trail based on a minimum ionization level is calculated at different altitudes for an illustrative re-entry. The influence of the trailing shock on the conduction part of the trail is discussed. A preliminary study is also made of the trail under chemically frozen conditions. (Author)

AD-269 326 Div. 9
(TISTP/MFA) OTS price $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
ON ONE DIMENSIONAL HYDROMAGNETIC FLOW WITH TRANSVERSE MAGNETIC FIELD, PART I. SIMPLE WAVE FLOW, PART II. FLOW IN A CHANNEL WITH SMALL AREA VARIATIONS,
by Roy M. Gundersen. Oct 61, 7p. 3 refs.
(MRC Technical summary rept. no. 269)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Fluid flow, Hydrodynamics, Magnetic fields, *Wave analysis, Gas flow, Wave transmission, Shock waves, *Magnetohydrodynamics.) (Particles, Velocity, Thermodynamics, Specific heat, Pressure, Entropy.) (Perturbation theory, Differential equations.)

The one-dimensional non-steady motion of an ideal, inviscid, perfectly conducting fluid subjected to a transverse magnetic field is studied. The particle velocity, local speed of sound, specific entropy, density, square of Alfven speed, permeability and ratio of specific heat at constant pressure and at constant volume are considered. Partial derivatives are denoted by subscripts, and all dependent variables are functions of x and t. (Author)

AD-269 350 Div. 9, 15, 10
(TISTP/TL) OTS price $2.60

Brown U., Providence, R. I.
EFFECTS OF CONDUCTION AND VISCOSITY ON THE STABILITY OF LAMINAR FLAME,
by J. Y. Parlange and Boa-Teh Chu. Sep 61, 19p. 5 refs. (Rept. no. AF 646/3)
(Contract AF 49(638)646, Proj. 9751)
(AFOSR-1594)
Unclassified report

DESCRIPTORS: (*Laminar boundary layer, *Flames, Conductivity, Viscosity, Stability, *Fluid flow, Gases, Exhaust gases, Mach number.) (Gas ionization, Chemical reactions, Temperature, Heat, Specific heat, Pressure.) (Molecular structure, Theory, Gases, Liquids.) (Perturbation theory, Equations, Differential equations, Partial differential equations.)

The effects of conduction and viscosity on the stability of laminar flame are examined. If L denotes the ratio of the wave length of a disturbance to the flame width and alpha is the ratio of the ultimate temperature of the burned gas to the initial temperature of the fresh mixture, the flame is found to be stable if L is less than (or equal to) 2 alpha/(alpha-1) multiplied by 1/RePr where Re is the Reynolds number of the flame based on the flame width and Pr denotes the Prandtl number of the mixture. It is further shown that the stabilization is achieved primarily through the effect of heat conduction on the flame speed rather than the influence of viscosity. (Author)

AD-269 351 Div. 9, 10, 25
(TISTP/TL) OTS price $2.60

Brown U., Providence, R. I.
ANALYSIS OF A SELF-SUSTAINED NONLINEAR VIBRATION IN A PIPE CONTAINING A HEATER,
by Boa-Teh Chu. Sep 61, 18p. incl. illus. 5 refs. (Rept. no. AF 646/4)
(Contract AF 49(638)646, Proj. 9751)
(AFOSR-1755)
Unclassified report

DESCRIPTORS: (Aerodynamics, Fluid flow, Gas flow, Oscillation, Pipes, *Heaters, Vibration, Analysis.) (Pressure, Specific heat, Sound, Theory, Shock waves, Mach number, Perturbation theory.) (Equations, Partial differential equations, Integral equations, Matrix algebra, Differential equations.) Gases, Combustion.

A pipe of length 2L closed at both ends contains a pressure-sensitive plane heater at its mid-section. The rate of heat release per unit area of the heater is assumed to vary with the pressure fluctuation. Such a system is unstable to small disturbances and a self-excited oscillation grows exponentially in time until nonlinear effects set in and shock waves are formed in the system. Ultimately a self-sustained nonlinear periodic vibration takes place in the pipe. When the feedback coefficient is small in comparison with unity, the nonlinear vibration can be calculated by a perturbation technique. (Author)

AD-269 352 Div. 9, 15, 10
(TISTP/TL) OTS price $3.60

Brown U., Providence, R. I.
EFFECTS OF A MAGNETIC FIELD ON THE STABILITY OF A LAMINAR FLAME,
by J. Y. Parlange and Boa-Teh Chu. Sep 61, 33p. incl. illus. (Rept. no. AF 646/5)
(Contract AF 49(638)646)
(AFOSR-1756) Unclassified report

DESCRIPTORS: (*Laminar boundary layer, *Flames, *Exhaust gases, Stability, *Magnetic fields, Propagation, *Fluid mechanics.) (Gases, Gas ionization, Fluid flow, Conductivity, Viscosity, Shock waves, Reynolds number, Electric fields, Electromagnetic waves.) (Equations, Integral transforms, Functions, Potential theory.)

The stability of a laminar flame in the presence of a magnetic field is examined. Two important cases are considered: In the first case, the imposed magnetic field is assumed to be parallel to the flame; in the second, it is assumed to be normal to the flame. It is shown that a flame cannot be stabilized by the imposition of such magnetic fields and that the parallel magnetic field of sufficient strength can have a stabilizing effect on some harmonic components only. (Author)

AD-269 381 Div. 9, 25
(TISTP/MFA) OTS price $3.60

General Dynamics/Convair, San Diego, Calif.
HYDRODYNAMICS OF RELAXING MEDIA,
by I. Oppenheim. 10 Feb 61, 38p. 5 refs. (Rept. no. ZPh-073)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: (*Hydrodynamics, Quantum mechanics, *Continuous media, *Relaxation time, Particles.) (Heat transfer, Energy, Thermodynamics, Entropy.) (Equations of Motion, *Partial differential equations, Integral transforms, Perturbation theory.)

A model system is considered in which there are relaxation lags in equilibration between sets of quantum states. In subsequent papers systems in which the various degrees of freedom are not in equilibrium will be treated. Application will be made to treatment of relaxation phenomena in the upper atmosphere both in the presence and absence of an orbiting vehicle. (Author)

AD-269 484 Div. 9, 2
(TISTP/MFA) OTS price $1.60

Directorate of Engineering Test, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
EXPERIMENTAL VERIFICATION OF THE FRICTIONAL PRESSURE DROP THROUGH POROUS MEDIA,
by Robert T. Crook. Oct 61, 11p. incl. illus. 3 refs.
(Proj. no. 1426)
(ASD TN 61-119) Unclassified report

DESCRIPTORS: (*Porous materials, *Air intake filters, Rock, Pressure, Fluid flow, Motion, Friction.) (Experimental data, Test equipment, Tests.)

The frictional pressure drop across a porous (36%) pebble bed was measured. The ratio of bed-to-pebble diameter was 72, sphericity of the pebbles was 1, and air flow rates varied from 0.13 to 1.3 lb/sec-sq ft, based on the bed area. The data obtained is compared to the data predicted by G. G. Brown, and to the work of P. C. Carman, D. E. Randall, and S. S. Millwright. Pebble motion within the bed and the effect of the method of flow initiation on the frictional pressure drop were also investigated. (Author)

AD-269 509 Div. 9, 15
(TISTP/MFA) OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
CLASSICAL STATISTICAL THEORY OF DIELECTRIC FLUIDS,
by Akira Ishihara and Russell V. Hanks. Sep 61, 27p. incl. illus. 4 refs. (Rept. no. D1-82-0128)
Unclassified report

Also available from the author.

DESCRIPTORS: (*Statistical analysis, Fluids, Gases, *Dielectrics, Polarization, Electric fields, Molecules, Dipole moments, Chemical bonds.) (Tensor analysis, Fourier analysis, Series, Integral transforms.)

A formal cluster expansion theory of the dielectric constants and the susceptibilities of non-polar fluids is developed and the deviation of the Clausius-Mossotti equation from experiments is discussed. Many body polarization effects are considered in terms of diagrams. A chain diagram approximation gives the susceptibilities in terms of the Fourier transforms of the Mayer f-function and of the effective dipole interaction tensor. (Author)

AD-269 510 Div. 9
(TISTA/WAW) OTS price $6.60

Boeing Scientific Research Labs., Seattle, Wash.
EFFECT OF SLIP ON THE LAMINAR BOUNDARY LAYER NEAR THE LEADING EDGE OF A FLAT PLATE IN HYPERSONIC RAREFIED GAS FLOW,
by Robert E. Street. Nov 61, 64p. incl. illus. (Rept. no. 49; D1-82-0138)
Unclassified report

DESCRIPTORS: (Sheets, Gas flow, Aerodynamics, *Hypersonics, *Superaerodynamics, Shock waves, Boundary layer, *Laminar boundary layer,

Friction, Drag, Heat transfer, Mathematical analysis, Differential equations, Partial differential equations, Integral equations, Series.)

Near the leading edge of a sharp flat plate in high speed, low density flow of high temperature gases the induced shock wave is almost straight and the pressure and velocity downstream are therefore approximately constant. Assuming that the outer edge of the viscous layer coincides with the shock wave in this region of the flow, it is possible to integrate the boundary layer equations with first order slip in the boundary conditions at the plate using a Gortler-type series in fractional powers of x, the longitudinal distance along the plate. The first two terms in this series have been found in closed, analytical form. To terms in x to the first power the result leads to a constant value of the skin friction coefficient and heat transfer coefficient. As an example the result is applied to a flat plate flying at Mach number 20 at 295,000 feet altitude, where the effects of slip are significant for a considerable distance downstream of the leading edge. (Author)

AD-269 539 Div. 9
(TISTA/WAW) OTS price $4.60

California U., Berkeley.
STRONG INTERACTION WITH SLIP BOUNDARY CONDITIONS.
Rept. on Research on Aerodynamic Flow Fields,
by J. Aroesty. Sep 61, 25p. illus. 25 refs.
(Contract AF 33(616)6161, Proj. 7064)
(ARL-64) Unclassified report

DESCRIPTORS: (*Airfoils, Aerodynamics, *Hypersonics, Shock waves, *Boundary layer, Interference, Pressure, Drag, Heat transfer, Mathematical analysis.)

A solution to the problem of strong interaction between the shock wave and the boundary layer has been obtained for the case where velocity slip and temperature jump boundary conditions are consistent at the wall. It is shown that the addition of slip boundary conditions yields a correction of order (boundary layer thickness/X) to the no slip solution. Estimates are made of the effect of slip on induced pressures and skin friction for the case of the adiabatic wall. In addition, it is shown that the inclusion of slip boundary conditions does not change the energy transfer to the wall from the no slip values. (Author)

AD-269 543 Div. 9, 25
(TISTP/MFA) OTS price $5.60

General Dynamics/Convair, San Diego, Calif.
NUMERICAL CALCULATION OF CHEMICALLY REACTING HYPERSONIC FLOW FIELDS,
by A. H. Schainblatt. 30 June 61, 56p. incl. illus., 5 refs. (Rept. no. ZPh-109)
(Contract DA 04-495-ORD-3113)
(ARPA order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: (*Hypersonic flow, *Chemical reactions, Transport properties, Gas flow) (Thermodynamics, Hydrodynamics, Dissociation.) (*Equations of state, Partial differential equations, Complex variables.) (Computers, Programming.)

The macroscopic equations of transport are specialized to an ideal, inviscid, non-diffusing gas. These equations are used as a model for describing plane or axially symmetric, chemically reacting hypersonic flow fields. Detailed numerical solutions are obtained by using finite difference procedures and the IBM-704 and -7090 digital computers. A description of the computer code, the results of a trial run, and some experiences with the use of the program, are presented. (Author)

AD-269 620 Div. 9, 25
(TISTP/JW) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE THEORY OF A DOUBLE GYRO-PENDULUM,
by N. Z. Sunnunov. 4 Aug 61, 8p. 5 refs. (Trans. no. MCL-1042/1 of Izvestiya Akademii Nauk Uzbekskoy SSR, Seriya Fiziko-Matematicheskikh Nauk 4:52-58, 1960)
Unclassified report

DESCRIPTORS: (*Gyroscopes, Differential equations, Resonance.) (Translations, USSR.) (Mechanics, Dynamics, *Motion, Theory.)

The motion of the axes of symmetry of the double gyro-pendulum is investigated. The periods of these motions are computed and resonance conditions are established.

AD-269 631 Div. 9
(TISTP/WH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE LAMINAR BOUNDARY LAYER OF A FLAT PLATE IN THE PRESENCE OF DISSOCIATION,
by Z. S. Galanova. 17 Aug 61, 7p. incl. illus. 4 refs. (Trans. no. MCL-1190/1 of Vestnik Leningradskogo Universiteta, Seriya Matematiki Mekhaniki I Astronomii 19:95-99, 1960)
Unclassified report

DESCRIPTORS: (Sheets, *Laminar boundary layer, Dissociation, Mathematical analysis, Differential equations.) (*Superaerodynamics, Velocity, Enthalpy.) (Fluid mechanics, Continuum mechanics, USSR.)

Second approximations of the solutions of laminar boundary-layer equations are derived for a heat-insulated flat plate and a flat plate with a given wall temperature. A numerical calculation of the heat-insulated flat plate for M numbers of 10, 20, and 30 is also given as an example; M is the Mach number on the outer boundary of the boundary layer. (Author)

AD-269 684 Div. 9
(TISTP/MFA) OTS price $9.60

James Forrestal Research Center, Princeton, N. J.
ON THE VISCOUS FLOW NEAR THE STAGNATION POINT ON AN INTERFACE,
by W. J. Prosnak. June 61. 49p. illus. tables, 8 refs. (Rept. no. 563)
(Contract AF 49(638)465, Proj. 9781)
(AFOSR-1592)
Unclassified report

DESCRIPTORS: (*Viscosity, *Fluid flow, Liquids, *Boundary layers, Shock waves, Wave transmission, Re-entry aerodynamics.) (Density, Velocity, Gravity, Temperature, Pres-

sure, Heat transfer, Thermal diffusion, Shear stresses.) (Perturbation theory, Complex variables, Differential equations, Integral transforms.) *Tables.

The viscous flow near the stagnation point on an interface between two liquids with different densities is studied. The use of a model allows some fairly general results to be readily obtained as a result of a mathematical analysis. Moreover, although the model is obviously not in full accordance with re-entry phenomena, it is believed that it is not over-simplified, and that solutions of real problems obtained on the basis of the results of the present study will be at least qualitatively correct. Equations governing the stated problem can be transformed to those describing the stagnation point flow at a rigid wall, but the boundary conditions are different. Results concerning the velocity and temperature fields based on a numerical integration of these equations are given. Also presented approximate formulas for heat transfer, displacement thickness, momentum thickness, boundary layer thickness, and temperature layer thickness. (Author)

AD-269 741 Div. 9, 25, 12
(TISTA/VGW) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
RADIATION FROM SHOCK-HEATED AIR. PART I. EQUILIBRIUM RADIATION,
by Hans G. Myer. Oct 61, 33p. incl. illus. 8 refs. (Rept. no. 6130-0001-NU-P01)
(Contract AF 04(694)1)
(BSD TN 61-21) Unclassified report

DESCRIPTORS: (Re-entry vehicles, Shock tubes, *Shock waves, Boundary layer, Re-entry aerodynamics, Aerodynamic heating, *Thermal radiation, *Heat transfer, Numerical analysis, Temperature, Density, Mathematical prediction.)

A computational procedure giving equilibrium radiative heat transfer rates to the surface of a shock engulfed vehicle is presented. The local transfer rates are obtained in terms of the local temperature and density at the outer edge of the boundary layer and an effective thermal layer. The computed radiative transfer rates around a typical entry vehicle are presented. A computational procedure for the non-equilibrium radiation is presented in Part II. (Author)

AD-269 758 Div. 9
(TISTA/VGW) OTS price $7.60

Therm Inc., Ithaca, N. Y.
GENERAL HARMONIC SOLUTIONS FOR THE DUCTED PROPELLER,
by D. E. Ordway and M. D. Greenberg. Aug 61, 69p. incl. tables, 11 refs. (Rept. no. TAR-TR 613)
(Contract Nonr-285900)
Unclassified report

DESCRIPTORS: (*Shrouded propellers, *Propeller shrouds, Aerodynamics, Load distribution, Vortices, Groups (Mathematics), Integral equations, Series, Mathematical analysis, Perturbation theory, Harmonic analysis.)

General harmonic solutions have been found for the camber problem of a ducted propeller with finite blade number in uniform motion at zero incidence. The fluid is assumed inviscid and incompressible. Principal attention is focused on the zeroth harmonic based on a successive iteration of the two-dimensional or sectional Glauert coefficients. In matrix form, the speed of convergence and identification of the limit are studied. Appropriate tables for typical shrouds are provided together with an illustrative example. Both the iteration procedure and direct simultaneous inversion yield solutions for the higher harmonics. (Author)

AD-269 817 Div. 9, 25, 15
(TISTP/TL) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
ON THE FUNDAMENTAL EQUATIONS OF THE KINETIC THEORY OF GASES,
by Gerald G. Comisar. 23 Oct 61, 24p. incl. illus. 14 refs. (Rept. no. TDR-930(2210-04)TR-1)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Gases, *Kinetic theory, Gas ionization, *Quantum statistics, Transport properties, Superaerodynamics.) (Spheres, Particles, Penetration.) (Integral equations, Integrals, Statistical analysis, Physics, Probability, Statistical distributions, Statistical functions, Functions.)

The truncation procedure of Grad is used to reduce the Liouville equation to a modified BBGKY kinetic hierarchy of integro-differential equations. By means of the usual dilute gas assumptions (i.e., the negligibility of the total molecular volume with respect to the entire gas volume, the predominance of short-range, binary collisions, and the slowness of the macroscopic spatial variations over molecular dimensions), this system transforms to a new kinetic hierarchy, whose members each resemble the Maxwell-Boltzmann equation of transport theory; irreversibility and closure are achieved via the introduction of a molecular chaos assumption. The Boltzmann-like character of the new system of equations is expected to lend itself readily to analysis by direct extensions of existing Boltzmann solution techniques. (Author)

AD-269 850 Div. 9
(TISTP/TL) OTS price $4.60

Geneynamics/Convair, San Diego, Calif.
EXPERIMENTAL DETERMINATION OF THE SLOW NO DECOMPOSITION REGIME AROUND 3000 DEGREES K BEHIND SHOCK WAVES,
by C. B. Ludwig, K. G. P. Sulzmann, and P. S. Hrbacek. 30 June 61, 37p. incl. illus. 10 refs. (Rept. no. ZPh-110)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59) Unclassified report

DESCRIPTORS: (*Shock waves, *Nitrogen compounds, *Oxides, *Infrared radiation, Velocity, Measurement, Temperature, Density, Optical systems.) (Heat transfer, Gages, Load distribution, Mach number, Vacuum systems, Photographic analysis.) (Electronic equipment, *Shock tubes, Oscillograms, Oscilloscopes, Miniature electronic equipment, Piezoelectric gages.)

The decomposition of nitric oxide between 2250 and 3450 K has been studied in shock tube experiments. The emitted infrared radiation of the fundamental band system of NO has been used to determine the time duration of the slow decomposition regime of NO behind shock waves in pure NO. It is found that the temperature dependency of the duration is in good agreement with the theoretical model we have described previously. (Author)

AD-269 896 Div. 9, 25
(TISTA/VGW) OTS price $8.10

Naval Ordnance Lab., White Oak, Md.
EFFECT OF FINITE OXYGEN RECOMBINATION RATE ON THE FLOW CONDITIONS IN HYPERSONIC NOZZLES,
by Walter J. Glowacki. 15 Oct 61, 81p. incl. illus. tables, 18 refs. (Aeroballistic research rept. no. 148; NOLTR 61-23)
Unclassified report

DESCRIPTORS: (Oxygen, Dissociation, Recombination reactions, Hypersonic nozzles, Rocket motor nozzles.) (*Gas flow, Hypersonics, Aerodynamics, Temperature, Pressure, Velocity, Density, Thermodynamics, Enthalpy, Mathematical analysis, Tables.)

The effect is estimated using for air a simplified model gas consisting only of O, O2, and N2. For the range of supply conditions considered, the gas composition freezes during expansion with the oxygen atom concentration depending strongly on supply conditions, less significantly on the nozzle geometry. The fractional departure of the flow parameters from equilibrium valves then depends on a good approximation only on the oxygen atom concentration. (Author)

10. FUELS AND COMBUSTION

AD-269 154 Div. 10, 25, 4
(TISTM/EJH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wrignt-Patterson Air Force Base, Ohio.
KINETIC COMBUSTION CONDITIONS FOR CONDENSED MIXTURES,
by N. N. Bakhman. 20 Dec 61, 7p. 5 refs.
(Trans. no. FTD-TT-61-298 of Doklady Akademii Nauk SSSR 140:141-144, 1961)
Unclassified report

DESCRIPTORS: (*Combustion, Mixtures, Solids, Gases, Liquids, Thermochemistry, Reaction kinetics, Theory.) USSR.

Kinetic combustion conditions, connected with the mixing of components in the preliminary zone, are of principal value for understanding the normal combustion rate u sub n of condensed mixtures. The latter must satisfy the condition of stationariness and be reproducible. Whereas, at d (particle size) greater than d sub min, the combustion rate oscillates with a period of approximately d/u and can be assumed constant only for sufficiently long charges. Errors due to unstationary combustion and unidentical mixtures can be made very small, but it is of principal importance to note that at d less than or equal to d sub min they completely disappear, and the combustion rate acquires the significance of a physico-chemical constant (u equals u sub n). (Author)

AD-269 195 Div. 10
(TISTA/SEB) OTS price $2.60

Beech Aircraft Corp., Boulder, Colo.
ESTABLISHING PROVEN DESIGN CRITERIA FOR CRYOGENIC BOOST TANKS.
Quarterly progress rept. no. 8 for period ending 31 July 61,
by J. G. Connelly and B. R. Etheridge. Dec 61, 39p. incl. illus. 2 refs.
(Contract AF 33(616)5154, Proj. 3084)
(DGRP TR-61-2) Unclassified report

DESCRIPTORS: (Liquid rocket propellants, Cryogenics, *Propellant tanks, Fuel tanks, Propellant tank liners, Insulating materials, Design, Processing, Heat transfer, Aerodynamic heating, Test methods, Test equipment.) (Liquefied gases, Hydrogen.) Thermal insulation.

The design and fabrication of two 7000 gal liquid hydrogen fuel tanks of Ti and stainless steel are described. Insulating materials and methods of insulation are also described. Tests were successfully conducted to check out the tank drain assembly. Further tests will be conducted to determine the heat transfer of the tanks during simulated rocket flight conditions.

AD-269 203 Div. 10, 4
(TISTM/GEC) OTS price $3.60

Callery Chemical Co., Pa.
PENTABORANE THERMAL STABILITY AT TEMPERATURES OF 100 DEGREES C, 125 DEGREES C AND 150 DEGREES C FOR 7 PERCENT ULLAGE.
by L. E. Samuelson. 21 Dec 61, 29p. incl. illus. tables, 6 refs.
(Contract NOa(s) 58-454-d)
Unclassified report

DESCRIPTORS: (*Pentaboranes, Fuels, Additives, Hydrogen, Decaboranes.) (Test methods, Temperature, Stability, Decomposition, Phase studies, Pressure, Physical properties.) (Test equipment, Design, Hazards.)

The thermal stability of B5H9 was determined as the rate of pressure increase in 800-ml test cylinders filled to 7% ullage. Decomposition of the B5H9 resulted in pressure increases from 3 to 1200 psig (approximately 6% decomposition of B5H9) at temperatures of 100, 125 and 150 C after 360, 28 and 3 hr, respectively. At long hold times and high temperatures the predicted percent decomposition was higher than the observed percent decomposition. Investigations were made to determine the effects of H and B10H14 on pentaborane thermal stability after 138 hr, at a temperature of 110 C and an ullage of 52%. The addition of 26.8 mol-% H (approximately 1175 psig) for one test and 9.2 mol-% B10H14 for another test resulted in 6.5% and 8.1% decomposition. A blank B5H9 test resulted in a 10.3% decomposition. (Author)

AD-269 353 Div. 10, 9
(TISTA/WAW) OTS price $1.10

Brown U., Providence, R. I.
THEORTICAL RESEARCH IN COMBUSTION AERODYNAMICS.
Final rept., 1 Oct 59-30 Sep 61,
by Boa-Teh Chu. Oct 61, 9p. (Rept. no. AF 646/6)
(Contract AF 49(638)646, Proj. 9751)
(AFOSR-1800) Unclassified report

DESCRIPTORS: (*Combustion, *Flames, Aerodynamics, Stability, Vibration, Theory, Scientific research.)

Division 11 - GROUND TRANSPORTATION EQUIPMENT

AD-269 500 Div. 10
(TISTA/SEB) OTS price $4.60

Aerojet-General Corp., Azusa, Calif.
HIGH-FREQUENCY COMBUSTION INSTABILITY.
Rept. for 15 Mar 57-18 Aug 61,
by R. G. Peoples, P. D. Baker and L. S. Knowles.
Nov 61, 26p. illus. 22 refs. (Rept. no. 2126)
(Contract AF 49(638)178, Proj. 9751)
(AFOSR-1802) Unclassified report

DESCRIPTORS: (*Combustion, Stability, High frequency, Shock waves, Acoustics, Oscillation, Jet acoustic oscillations, Pressure, Theory, Mathematical analysis.) (Test methods, Test equipment, Combustion chambers.) Combustion chamber gases.

Analytical and experimental studies of stable and unstable combustion phenomena were conducted to determine the parameters affecting inherent stability. It was demonstrated that inherent stability is determined by the amount of pressure-sensitive energy available to a given pressure perturbation, and by the relationship between replenishment of this energy and the time period of the perturbation. Analytical concepts describing the support mechanism and experimental data indicating the complexity of a nonlinear perturbation were established. (Author)

AD-269 584 Div. 10
(TISTA/SEB) OTS price $9.10

Lockheed Aircraft Corp., Marietta, Ga.
MAIN PROPELLANT TANK PRESSURIZATION SYSTEM STUDY AND TEST PROGRAM. VOLUME III. DESIGN HANDBOOK.
Final rept., 1 July 60-31 Oct 61.
Dec 61, 95p. incl. illus. tables, 11 refs. (Rept. no. ER 5296)
(Contracts AF 04(611)6087 and AF 04(611)7032, Proj. 6753)
(SSD TR 61-21, vol. 3) Unclassified report

DESCRIPTORS: (Liquid rocket propellants, *Propellant tanks, Pressure, Configuration, Geometry, Volume, Design, Military requirements, Mathematical analysis, Handbooks.) (Gas generating systems, Rocket fuels, Rocket oxidizers, Vaporization, Combustion.) (Gases, Liquefied gases, Oxygen, Hydrogen, Hydrazines, Methyl hydrazines, Nitrogen compounds, Tetroxides, Storage.) (Propellant tank liners, Materials, Metals, Physical properties.) Heat exchangers.

Design information on liquid propellant tank pressurization systems is presented. The areas covered are: pressurization gas requirements, including hand calculation procedures and nomographs; tankage, including material properties and volume and wall area curves; and components, including stored He system weight curves and a simple but accurate heat exchanger design method. (Author)

AD-269 691 Div. 10
(TISTA/SEB) OTS price $2.60

Princeton U., N. J.
RESEARCH ON SOLID PROPELLANT COMBUSTION INSTABILITY.
Quarterly progress rept. no. 2, 1 Aug-31 Oct 61,
by R. H. Woodward and Joseph Wenograd.
20 Dec 61, 12p. illus. table, 5 refs. (Aeronautical Engineering rept. no. 564-b)
(Contract AF 49(638)1073)
(ARPA Order no. 24-61) Unclassified report

DESCRIPTORS: (Solid rocket propellants, *Combustion, Stability, Acoustics, Oscillations, Jet acoustic oscillations, Pressure, Temperature, Velocity, Theory, Mathematical analysis.) (Combustion chamber gases, Luminescence.)

A fundamental study of the non-steady combustion of solid propellants with application to rocket instability is described. A film strip of a metallized solid propellant burning in an oscillating pressure field was analyzed in order to determine the phase relationship between the imposed pressure maxima and an apparent wave of luminosity in the combustion gases. The implications of these observations as they affect the model of the burning propellant are briefly considered. Two types of experimental observation which will be used to study non-steady combustion are outlined. One method involves the measurement of the temperature of the combustion gases downstream from the flame zone. The use of a particle track method for the observation of pressure-velocity relationships in the burnt gases is also considered. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-269 072 Div. 11, 2
(TISTP/FR) OTS price $2.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
AN INSTRUMENTATION SYSTEM FOR THE MEASUREMENT OF TERRAIN PROFILE,
by Irvin J. Sattinger and Sidney Sternick.
Dec 61, 22p. incl. illus. table, 9 refs. (Rept. no. 2948-36-F)
(Contract DA 20-018-ORD-20815)
Unclassified report

DESCRIPTORS: (*Terrain, Geometry, Measurement, Instrumentation.) (Vehicles, Motion, Terrain, Dynamics, Analysis.) (Tracked vehicles, Gyroscopes, *Odometers, Electronic equipment, Data processing equipment.) (Errors, Analysis.) (Army operations, *Military transportation, *Terrain.)

An instrumentation system for the measurement of terrain profile was developed and tested. Its purpose is to provide a means for the rapid and accurate collection of terrain-profile data useful in analyzing the rough-ground performance of cross-country vehicles. The field equipment consists of a two-wheeled measuring assembly which is towed across the ground at a speed not exceeding 5 mph. Electrical instruments mounted on the assembly continuously measure the slope of the ground and the distance traveled along the surface. These quantities are recorded on magnetic tape. The magnetic tape is then returned to a laboratory data-processing system which obtains the profile data by integrating the slope of the ground with respect to surface travel. Preliminary analysis and tests indicate that the system is capable of obtaining terrain profile with an error having a standard deviation of not more than 4 inches in 100 feet. (Author)

AD-269 075 Div. 11, 2
(TISTP/FR) OTS price $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
AN INSTRUMENTATION SYSTEM FOR MEASURING STRESS-STRAIN RELATIONSHIPS OF SOIL,
by Irvin J. Sattinger and Sidney Sternick.
Dec 61, 10p. incl. illus. 2 refs. (Rept. no. 2948-35-F)
(Contract DA 20-018-ORD-20815)
Unclassified report

DESCRIPTORS: (*Soils, Physical properties, Load distribution, Pressure, Penetration, Shear stresses, Deformation, Measurement, Instrumentation, Tracked vehicles, Strain gages, Data processing systems, (*Army operations, *Military transportation, Terrain, Soils.)

An instrumentation system for measuring and analyzing data on stress-strain relationships of the soil was designed and constructed. The field portion of the system consists of a shearmeter and two penetrometers for measuring the effects of horizontal and vertical loading of the soil, respectively. These units, hydraulically operated, are mounted on the rear unit of a Polecat, an articulated tracked vehicle. Test runs are recorded in the field on magnetic tape. A general-purpose data-processing system for laboratory installation has also been provided to permit magnetic-tape playback of the test runs, and conversion to digital form for insertion into a digital computer. (Author)

AD-269 151 Div. 11, 7
(TISTE/NTM) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INNOVATIONS IN MOTOR VEHICLE ENGINEERING.
20 Dec 61, 2p. (Trans. no. FTD-TT-61-200 of Tudomany es Technika 19, 668p., 1961)
Unclassified report

DESCRIPTORS: (*Ignition systems, *Piezoelectric crystals, USSR.) (Piezoelectric materials, Zirconium, Titanium, Ceramic materials, Life expectancy, Tests.) (Vehicles, Motorcycles, Electrical equipment, Ignition systems.)

Successful experiments with piezoelectric ignition indicate that in the future, this ignition will come into use. The advantage of the new piezoelectric ignition system is its simple design and consequently its low price; further, it needs little space (the ignition system for a one-cylinder motor fits into a space of 56 cubic centimeters and weighs 0.24 kilograms). The life span of the piezoelectric system is very long; it withstood 1,000 hours of testing in a 1-cylinder 2-phase motor. Its life-span was limited not by the crystal but by mechanical wear of the metal parts. The crystal life-span is five times that of the motor. (Author)

12. GUIDED MISSILES

AD-269 014 Div. 12, 28
(TISTA/VGW) OTS price $2.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
EFFECTS OF OUTER-SPACE ENVIRONMENT IMPORTANT TO SIMULATION OF SPACE VEHICLES.
Rept. for 1 Nov 59-30 Sep 60 on Effects of Outer-Space Environment Important to Simulation of Space Vehicles,
by Eugene M. Hart. Aug 61, 106p. incl. illus. tables, 127 refs.
(Contract AF 33(616)6858, Proj. 6114)
(ASD TR 61-201) Unclassified report

DESCRIPTORS: (*Space environmental conditions, Spaceships, Spaceship cabins, Design, Simulation of Space flight, Flight simulators for Training devices.) (Radiation hazards, Electromagnetic effects, Radiation effects, Solar energy, Particles, Cosmic rays, X rays, Gamma rays, Ions, Photons.) (Hazards from Meteors, Meteorites, Interstellar matter, Upper atmosphere, Electromagnetic fields, Electrostatic fields, Gravity.)

The results of a literature survey to define the effects of the outer-space environment important to the simulation of space vehicles are presented. The discussion is general, having not been constrained by the inclusion of specific vehicles or trajectories. Only the natural environment of space is considered and the survey is limited to the solar system with particular emphasis on the region in the near vicinity of the earth-moon system and at heights greater than 80 kilometer above the earth's surface. To specify those effects that need to be incorporated into a space training simulator, the exterior environment, its effects on the vehicle and crew, and the malfunctions that may result must be determined. These subjects are treated, along with a consideration of the adequacy of the existing data in the study. Recommendations for further study are presented. (Author)

AD-269 015 Div. 12
(TISTA/LSK) OTS price $19.75

General Dynamics/Astronautics, San Diego, Calif.
APPROXIMATE TRANSFER FUNCTIONS FOR FLEXIBLE-BOOSTER-AND AUTOPILOT ANALYSIS,
by David R. Lukens, Alfred F. Schmitt, and George T. Broucek. Apr 61, 143p. illus. tables, 92 refs.
(Contract AF 33(616)7037, Proj. 8219)
(WADD TR 61-93) Unclassified report

DESCRIPTORS: (Guided missiles, Surface to surface, Hypervelocity vehicles, Liquid rocket propellants, Motion, Booster rockets, Elasticity, *Dynamics, Moments, Stability, Stability (Lateral), Stability (Longitudinal), Automatic, Stabilization systems, Servo systems, *Control systems, Automatic pilots, Mathematical analysis, Numerical analysis, Functions, Mathematical prediction, Equations.)

Information is presented to enable an engineer to understand and analyze the phenomena associated with a flexible-booster-and-autopilot analysis. Simplifications and approximations are given for all phases of synthesis and analysis, and the limitations of the simplified solutions are discussed. The development of methods for synthesis and analysis of flexible boosters is presented in several stages--from simple linear techniques useful for predesign or preliminary design analysis, up to the complex forms requiring computer solutions, which may be used to verify the adequacy of the final flexible-booster-and-autopilot configuration. The methods of synthesis and analysis are presented with 3 limitations: (1) a linear airframe is assumed; (2) the aerodynamic surfaces (wings) are assumed to be small and relatively rigid; and (3) the aero-

dynamics are represented by a simple quasi-steady model. Results indicate that accurate solutions for most nonwinged flexible boosters can be achieved by simple root-locus techniques involving linearized equations. (Author)

AD-269 039 Div. 12, 6
(TISTW/DLW) OTS price $8.10

General Dynamics/Convair, San Diego, Calif.
STUDIES PERTAINING TO BAMBI. SPACE-TIME SAMPLING AND FILTERING.
Final rept.,
by W. D. Montgomery and P. W. Broome. Dec 61, 75p. incl. illus. 7 refs. (Rept. no. ZR-AP-061-23)
(Contract AF 04(647)644)
(ARPA Order no. 153-60)
Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, *Satellite vehicles, Optical systems, Infrared optical systems, *Optical filters, *Infrared filters, Optical images, Infrared images, Sampling, Signal-to-noise ratio, Statistical functions.) (Guided missiles, Surface to surface, Launching, Detection, Detectors.)

Methods were developed which are applicable to the problem of manipulating visual data available to a satellite so as to enhance the detection of a given target. Study was oriented toward the detection of a missile in the powered phase. Considering the intensity distribution on an optical image plane as the input, four different types of spatial filters are developed. The statistical description of the background, which must be known prior to applying the theory, varies from the autocorrelation function for a linear filter to a complete statistical description for the general statistical and decision theory filters. (Author)

AD-269 042 Div. 12, 30
(TISTW/DLW) OTS price $1.60

Goodrich, B. F., Co., Akron, Ohio.
AFT-END CLOSURE STUDY FOR POLARIS A-3 ROCKET MOTOR CASE.
Monthly progress rept. no. 4, 26 Aug-26 Sep 61,
by H. W. Stevenson and R. A. Harrington.
30 Dec 61, 10p. incl. illus. tables.
(Contract NOw-61-0499-c)
Unclassified report

DESCRIPTORS: (*Guided missiles, Underwater to surface, Rocket motors, *Rocket cases, Combustion chambers, Glass textiles, Metal glass adhesives, Rubber seals, Bonding, Aluminum alloys, Shear stresses, Stresses, Hydrostatic pressure, Tests.) (Rocket cases, Filament wound construction, Test methods.)

Testing of shear test specimens was continued to determine the optimum adhesive bond between the aluminum cluster fitting and the fiberglass chamber. Testing of double-lap specimens is reported. Fabrication and testing of subscale chambers was continued. Four additional chambers were also tested. (Author)

AD-269 056 Div. 12, 30
(TISTW/DLW) OTS price $1.10

Kidde, Walter, and Co., Inc., Belleville, N. J.
FIBERGLASS MOTOR CASE STUDY. POLARIS SECOND STAGE END CLOSURE.
Interim progress rept., 1-30 Nov 61,
by T. Siuta. 12 Dec 61, 3p. illus. (Rept. no. 3642-8)
(Contract NOw-61-0497-c)
Unclassified report

DESCRIPTORS: (*Guided missiles, Underwater to surface, Rocket motors, *Rocket cases, Glass textiles, Filament wound construction, Hydrostatic pressure, Stresses, Tests, Model tests.)

Investigations were made to prepare hardware and determine deflection and stress characteristics on the scale model Polaris rocket case configuration. The fabrication is described of the hydrostatic test rig for the 1/4 scale Polaris case. Fabrication and testing of the initial 1/4 scale model Polaris case is also described. The case was checked at 40 psig and then brought up to the proof pressure of 390 psig at a rate of 150 psig per minute and remained at this pressure for one minute. The pressure was then reduced to 50 psig to permit removal of several dial indicators which would be damaged during the subsequent burst test. The case was then repressurized at approximately 42 psig per second until burst occurred at 590 psig. The failure occurred at the dome skirt juncture and extended about 220 degrees around the circumference. Preliminary calculations show the composite hoop wall stress in the cylinder (based on wall thickness) at failure was 127,000 psi yielding a hoop and longitudinal glass loading of 6.3 lb/end and 6/18 lb/end, respectively. (Author)

AD-269 104 Div. 12
(TISTA/WAW) OTS price $2.60

Rand Corp., Santa Monica, Calif.
SATELLITE CHARGE-UP AS A MEANS OF MAINTAINING THE SHAPE OF ECHO-TYPE SATELLITES IN THE OUTER VAN ALLEN BELT,
by R. O. Hundley. Dec 61, 21p. incl. tables, 4 refs. (Research memo. no. RM-2921-NASA)
(Contract NASr-2102)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, Balloons, Satellites, Radio, Reflectors, Radio communication systems, Hazards from Meteorites, Reduction by Van Allen radiation belts, Electrical effects.)

The possibility of using satellite charge-up as a means of maintaining the shape of Echo-type satellites in the outer Van Allen belt is considered. The electrostatic repulsive force due to satellite charge-up is calculated, as well as the principal forces causing satellite collapse--namely the plasma pressure, the radiation pressure, and the gravitational gradient. Based on existing experimental data concerning the Van Allen electrons, it is concluded that the charge-up method of maintaining satellite shape would probably not be useful for opaque satellites. For partially transparent balloon satellites at the center of the outer Van Allen belt the method might be useful part of the time; for partially transparent satellites at the lower edge of the outer Van Allen belt the method would be, at best, marginally useful. (Author)

AD-269 114 Div. 12, 2
(TISTA/VGW) OTS price $5.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
THE ORBITS OF THE SATELLITES 1959 ALPHA-1 AND 1959 ALPHA-2 AND THE PERTURBATIONS ON THE PERIGEE DISTANCE OF 1959 ALPHA-1.
Rept. on Research in Space Science, by Rajendra C. Nigram. 24 Nov 61, 51p. incl. illus. tables, 6 refs. (Special rept. no. 81)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Orbital flight paths, Tracking telescopes, Astronomical data, Tables.) (Drag, Celestial mechanics, Perturbation theory, Mathematical analysis.)

Orbital information is given for the alpha 1 and 2 for the period April 2, 1960, through August 1, 1961. Other parameters related to the perturbing effects of the atmospheric drag such as the angle between the sun and the perigee (psi), the latitude of perigee (phi), etc., are also given. The various perturbations on the perigee distance of Satellite 1959 alpha 1 have been taken into account for a period of two years and five months beginning from launch on February 18, 1959, through August 1, 1961; they show that the radiation pressure produces a variation in the perigee distance of this satellite with a period of 450 days and an amplitude of 1.5 km. (Author)

AD-269 115 Div. 12, 2
(TISTA/VGW) OTS price $2.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
CATALOG OF PRECISELY REDUCED OBSERVATIONS NO. P-1.
Rept. on Research in Space Science, by George Veis. 30 Nov 61, 28p. incl. tables, 4 refs. (Special rept. no. 82)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Orbital flight paths, Tracking telescopes, Astronomical data, Tables.)

The catalog is the first in a new series of the Smithsonian Astrophysical Observatory (SAO) special reports on research in space science. The series will give the positions of artificial satellites as obtained by the SAO Photoreduction Division from the precise reduction of the films taken at the 12 Baker-Nunn Stations. These catalogs are scheduled to appear regularly and in the same form, each covering a period of six months of observations on satellites tracked by the Smithsonian Astrophysical Observatory. Each catalog will include all precisely reduced observations made during that period that have been checked and found to be without important errors. (Author)

AD-269 178 Div. 12, 14, 25, 4
(TISTM/GEC) OTS price $3.60

AVCO Research Lab., Everett, Mass.
HYPERSONIC ABLATION AND INTERPRETATION OF TEST RESULTS.
by S. Georgiev. Oct 60, 36p. incl. illus. 19 refs. (Research rept. no. 99)
(Contract AF 04(647)278)
(AFBSD TR 61-31) Unclassified report

DESCRIPTORS: (Hypervelocity vehicles, Satellite vehicles, *Re-entry aerodynamics, Re-entry vehicles, Simulation, *Ablation, *Aerodynamic heating, Absorption, Laminar boundary layers, Turbulent boundary layers.) (Materials, Glass textiles, Silicon compounds, Oxides, Sublimation, Plastics, Quartz, Energy, Absorption, Combustion, Plasma jets.) (Enthalpy, Specific heat, Heat of fusion, Vaporization.)

Simulation parameters for steady state hypersonic ablation are discussed for several different classes of ablating materials. The difference in test results obtained in different facilities was explained. The information required to correlate results from different test facilities with each other are: (1) the stagnation enthalpy of the test gas, (2) the surface temperature of the ablating material, (3) the heat transfer rate to a non-ablating surface at the ablation temperature, (4) the radiant energy emitted from the ablating surface, and (5) the mass rate of ablated material. Proper interpretation of test results and the use of theory enabled the prediction of the flight performance of ablating materials. (Author)

AD-269 179 Div. 12, 7
(TISTA/MS) OTS price $11.00

Aerospace Corp., El Segundo, Calif.
APPLIED RESEARCH MANAGEMENT ABSTRACT BULLETIN. PART I. ABSTRACTS 1-229 THROUGH 1-448.
Aug 61, 147p. (Rept. no. TDR-930(2701-01)TN-1, pt. 1, no. 2)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Space flight, *Power supplies, *Bibliography.) (Auxiliary power plants, Electric power production, Propulsion, Materials.)

AD-269 185 Div. 12
(TISTW/LH) OTS price $6.60

Autonetics, Downey, Calif.
GUIDANCE AND CONTROL EQUIPMENT FOR MINUTEMAN. BIBLIOGRAPHY.
30 Sep 58, rev. 31 Mar 61, 62p. (Rept. no. EM-5544)
(Contract AF 04(647)256)
Unclassified report

DESCRIPTORS: (*Bibliography, Guided missiles, Surface to surface, *Guidance, Control, *Control systems.)

AD-269 197 Div. 12
(TISTA/SEB) OTS price $3.60

Aeronautical Research Lab., Office of Aerospace Research, Wright-Patterson Air Force Base, Ohio.
PROBLEMS OF THE MECHANICS OF INTERPLANETARY SPACE TRAVEL,
by C. A. Traenkle. Nov 61, 33p. incl. illus. tables, 11 refs. (ARL-141)
(Proj. no. 7071)
Unclassified report

DESCRIPTORS: (*Spaceships, *Space flight, Space probes, Space navigation, *Celestial mechanics, Launching, Flight paths, Velocity, Thrust, Gravity, Mathematical analysis, Theory.)

After a short delineation of the planetary system and the basic mechanical laws governing the motion of bodies in space, 3 classes of impulsive thrust trajectories of space vehicles are analyzed with respect to their characteristic parameters of velocity sum, rocket performance and travel time: class A, cotangential ellipses of major axis span, i.e. Hohmann ellipses; class B, intersecting ellipses of minor axis intercept, class C, intersecting conics of direct reflection intercept and of minimum travel time. The influence of the local gravity fields of the planets is allowed for. The mutual merits and limitations of these various trajectory classes are weighed against each other. The error analysis of the injection process is reviewed and the potentialities of midcourse and terminal navigation are considered in this respect. A number of representative future space missions are compared with respect to rocket motor requirements and travel time. (Author)

AD-269 204 Div. 12
(TISTW/RD) OTS price $7.60

General Dynamics/Astronautics, San Diego, Calif.
OPERATIONAL GROUND SUPPORT EQUIPMENT SYSTEM SPECIFICATION FOR 566TH SMS-OFFUTT AIR FORCE BASE.
Rept. on WS 107A-1 Program.
15 May 61, 62p. (Rept. no. AZD-27-009B, supersedes AZD-27-009A, AD-319 134)
(Contract AF 04(645)4)
Unclassified report

DESCRIPTORS: (*Ground support equipment, Specifications for Surface to surface, *Guided missiles.) (Launching, Preparation, Maintenance.) (Booster rockets, Handling, Transportation.) Hydraulic systems, Fuel consumption, Reliability.

AD-269 223 Div. 12
(TISTW/DLW) OTS price $3.60

General Electric Co., Burlington, Vt.
XM143E1 WARHEAD SECTION SHIPPING AND STORAGE CONTAINER STUDY.
Final summary rept.
15 July 61, 31p. incl. illus.
(Contract DA 28-017-501-ORD-3617)
Unclassified report

DESCRIPTORS: (Guided missile warheads, *Nuclear warheads, *Containers, Storage, Shipping, Handling, Mounting brackets, Vibration isolators, Effectiveness, Costs, Design.)

Work is reported on the redesign of the XM143 atomic warhead case. The new unit was designated the XM143E1 container. The design of the container was refined to reduce both weight and cost, while keeping the container's universality. The case was designed to utilize standard manufacturing techniques. Design of the suspension frame was required to maintain function and support location and to improve loading action. Stacking brackets, shock mounts, and latches were redesigned. The design of the over-all container was refined to insure maximum usage of the most economical standard hardware and materials available. (Author)

AD-269 228 Div. 12
(TISTW/CCH) OTS price $5.60

Hercules Powder Co., Bacchus, Utah.
BIBLIOGRAPHY OF RESEARCH AND DEVELOPMENT REPORTS (REVISION NO. 5).
Rept. for 1 Oct-31 Dec 60 on Weapon System 133-A, Minuteman Stage III.
Jan 61, 47p. incl. tables (Rept. no. MCS-2-5)
(Contract AF 04(647)243)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Bibliography.) (*Guided missile research, Scientific reports.)

AD-269 238 Div. 12, 9
(TISTA/SEB) OTS price $9.60

Lockheed Aircraft Corp., Marietta, Ga.
SURVEY AND ANALYSIS OF HYPERSONIC AND RE-ENTRY VEHICLES.
Rept. on Research on Aerodynamic Flow Fields, by R. H. Lange, B. H. Little, Jr. and others.
Sep 61, 113p. incl. illus. 521 refs.
(Contract AF 33(616)7237, Proj. 7064)
(ARL-62) Unclassified report

DESCRIPTORS: (*Re-entry vehicles, *Hypervelocity vehicles, Flight paths, Shock waves, Re-entry aerodynamics, Superaerodynamics, *Hypersonics, Ablation, Boundary layer, *Aerodynamic heating, Friction, Heat transfer, Lift, Drag, Pressure, Theory, Mathematical analysis.) *Bibliography.

A survey and analysis was made of the aerothermodynamic problem areas in the flight spectrum of hypersonic glide and re-entry vehicles. This flight spectrum was defined by speeds between 5000 ft/sec and orbital speed and by altitudes between 100,000 and 400,000 feet. Major problem areas of flight within this spectrum were analyzed to determine the coverage of existing data and to recommend areas where further research is needed. (Author)

AD-269 246 Div. 12, 33
(TISTW/DLW) OTS price $4.60

Aerojet-General Corp., Sacramento, Calif.
MOBILITY ENVIRONMENT INVESTIGATION PROGRAM, VOLUME 9.
Technical operating rept. on Weapon Systems 133A and 133A-M. Detailed Program Plan, by C. C. Conway. 10 May 61, 43p. incl. table.
(Rept. no. 0162-01PP-5)
(Contract AF 33(600)36610)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, Cargo vehicles, Railroads, *Transportation, Rocket motors, Mobile, Solid rocket propellants, Vibration, Shock resistance, Stresses, Tensile properties, Tests, Test methods.) Propellant grains, Mechanical properties.

This report includes:
DETAILED TEST PLAN FOR THE VIBRATION TEST OF A SECOND-STAGE MINUTEMAN ENGINE, APPENDIX.
10 May 61, 19p. table.

A critical factor in the mobile Minuteman program is the ability of the missile and its separate stages to withstand in-transit vibration and shock. During tests, the engine and individual components will be subjected to simulated

environmental conditions of vibration and shock. Analytical stuides will be made of grain integrity and the effects of longitudinal, transverse, and radial dynamic loads on the engine. The testing program will provide data for ensuring the durability of the engine during transport. (Author)

AD-269 253 Div. 12
(TISTW/RD) OTS price $5.00

Minneapolis-Honeywell Regulator Co., Minn.
AN ANALYTICAL INVESTIGATION OF FLIGHT CONTROL PROBLEMS AND STATIC AND DYNAMIC RESPONSE REQUIREMENTS OF A HIGH-SPEED, LOW-ALTITUTE MISSILE.
Rept. for July 60-Mar 61 on Project SLAM (SDR-11),
by J. F. L. Lee, R. C. K. Lee and others.
Sep 61, 297p. incl. illus. tables, 57 refs.
(MH rept. no. 2492-TR-1)
(Contract AF 33(616)7419, Proj. 8219)
(ASD TR 61-159) Unclassified report

DESCRIPTORS: (*Digital systems for Flight, *Control of *Guided missiles.) (Synthesis, Circuits, *Digital systems.) (Digital computers, Analog computers, Operation.) (Simulation of Equations of Motion on Analog computers.) (Mathematical analysis of Aerodynamic data for Launching of Guided missiles.) (*Control systems, Guidance, Reliability.) (Nuclear propulsion, Guided missiles.)

The results of a study of the flight control problems of a high-speed, low-altitude missile are presented. Investigations were also made in the areas of gust analysis; reactor, inlet, and control system coupling; and basic vehicle stability and control. The effects of sampling frequency (data rate), computation time delay, and transport lags on over-all system performance are presented. (Author)

AD-269 282 Div. 12
(TISTA/WAW) OTS price $1.25

Michigan U., Ann Arbor.
FLIGHT SIMULATION OF ORBITAL AND REENTRY VEHICLES. PART I - DEVELOPMENT OF EQUATIONS OF MOTION IN SIX DEGREES OF FREEDOM.
Rept. for May 59-Oct 60 on Training Equipment, Simulators, and Techniques for Air Force Systems,
by Gabriel Isakson. Oct 61, 33p. incl. illus. 3 refs.
(Contract AF 33(616)5664, Proj. 6114)
(ASD TR 61-171, pt. 1)
Unclassified report

DESCRIPTORS: (*Re-entry vehicles, *Satellite vehicles, Atmosphere entry, *Flight simulators, Pilots, Training devices.) (Satellite vehicle trajectories, Flight paths, Dynamics, Mathematical analysis, Equations, Differential equations, Matrix algebra, Digital computers.)

Equations governing the motion of a lifting reentry vehicle in six degrees of freedom are developed for simulation purposes. Effects of earth rotation, earth oblateness and wind velocity are included. The rotational equations are conventional equations involving angular rates referred to body axes. Two different formulations of the translational equations are presented, using different coordinate systems. One involves spherical coordinates referred to the equatorial plane of the rotating earth; the other involves spherical coordinates referred to a nominal trajectory plane fixed with respect to inertial axes. The former has the advantage that earth rotation and oblateness are taken into account more simply, but an indeterminacy is encountered in the event of flight over a pole. The latter formulation eliminates this indeterminacy but is otherwise more complex.. It is concluded that the equations developed are suitable for digital or hybrid analog-digital computation, but that accuracy requirements would be excessive for analog computation exclusively. An alternative formulation, suitable for analog computation, is presented in Part II of the present series (AD-269 283). (Author)

AD-269 283 Div. 12
(TISTA/WAW) OTS price $1.25

Michigan U., Ann Arbor.
FLIGHT SIMULATION OF ORBITAL AND REENTRY VEHICLES. PART II - A MODIFIED FLIGHT PATH AXIS SYSTEM FOR SOLVING THE SIX-DEGREE-OF-FREEDOM FLIGHT EQUATIONS.
Rept. for May 59-Feb 61 on Training Equipment, Simulators, and Techniques for Air Force Systems,
by L. E. Fogarty and R. M. Howe. Oct 61, 31p. incl. illus. 1 ref.
(Contract AF 33(616)5664)
(ASD TR 61-171, pt. 2) Unclassified report

DESCRIPTORS: (*Re-entry vehicles, *Satellite vehicles, Atmosphere entry, *Flight simulators, Pilots, Training devices.) (Satellite vehicle trajectories, Flight paths, Dynamics, Mathematical analysis, Equations, Differential equations, Vector analysis, Analog computers.)

Three translational and three rotational equilibrium equations for an orbital vehicle subject to aerodynamic and jet reaction forces are derived using a modified flight-path axis system for the translational equations. Dependent variables of the system are horizontal velocity component, vertical velocity component, and flight-path heading angle. Resulting equations are shown to have advantages for computer mechanization over alternative axis systems for the translational equations. Complete equations for determining vehicle orientation, instantaneous latitude and longitude, angle of attack, angle of sideslip, aerodynamic forces and moments, etc., are presented. Modifications in the translational equations which allow direct solution by an analog computer are also given. Analog computer mechanization of these equations in both real and fast time is described, including a novel technique for division which preserves favorable multiplier scaling. Specific machine results are presented which demonstrate accurate solution of close-satellite trajectories, including re-entry from satellite altitudes to sea level. (Author)

AD-269 299 Div. 12
(TISTA/SEB) OTS price $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
DYNAMIC LOADS IN THE ATLAS-ABLE 5 DURING TRANSONIC BUFFETING,
by A. P. Goldberg and J. D. Wood. 22 Aug 60, 18p. incl. illus. tables (Rept. no. STL/TM-60-0000-19075)
Unclassified report

DESCRIPTORS: (*Space probes, *Guided missile noses, Load distribution, Transonic flight, Transonics, Shock waves, Pressure, Oscillations, Theory, Mathematical analysis.)

Dynamic loads are determined for the Atlas-Able 5 vehicle during transonic flight due to unsteady aerodynamic pressures acting on the nose fairing. These pressures occur as random variables and appear to be associated with shock

front oscillations and vortex shedding phenomena. Such phenomena may occur due to nose fairing shape, Mach number of flow, and angle of attack. (Author)

AD-269 301 Div. 12
(TISTA/SEB) OTS price $6.60

Space Technology Labs., Inc., Los Angeles, Calif.
EQUIPMENT DESIGN CONSIDERATIONS FOR SPACE ENVIRONMENT,
by S. N. Lehr, V. J. Tronolone, and P. V. Horton. Sep 60, 68p. incl. illus. tables, 79 refs. (Rept. no. STL/TR-60-0000-09224)
Unclassified report

DESCRIPTORS: (*Space environmental conditions on Spaceships, Space flight, Airframes, Electrical equipment, Electronic equipment, Electromechanical converters, Materials, Plastics, Metals, Alloys, Ceramic materials, Elastomers, Radiation damage, Radiation effects, Electromagnetic effects, Thermal radiation, Meteorites, Vacuum systems, Temperature control.)

A review is presented on the effect of space conditions on materials and electronic parts used successfully in those space vehicles which have accomplished their objectives. Information is given on the selection of materials and electronic parts for space applications based on knowledge of both the known and the calculated or estimated characteristics of space environment. (Author)

AD-269 302 Div. 12
(TISTA/SEB) OTS price $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
TEMPERATURE CONTROL SYSTEM FOR THE ATLAS ABLE-4 LUNAR SATELLITE,
by R. M. Acker, R. P. Lipkis, and J. E. Vehrencamp. 31 Mar 60, 18p. incl. illus.
Unclassified report

DESCRIPTORS: (*Lunar probes, Satellite vehicles, Temperature, Control, *Temperature control, Design.)

The need to control the mean internal temperature of the Able-4 Atlas lunar satellite within the range of 45 to 70 F led to the development of an active, lightweight closed loop temperature control system. The system senses internal temperatures and alters the effective radiation properties of the satellite so as to maintain the internal temperature with the specified range, even in the event of some adverse effects of the space environment on the radiation properties. The system consists of 50 rotatable four-bladed masks, each actuated by a spirally wound bimetal strip; the rotation of the masks (which control 20% of the satellite surface) exposes surface areas having differing absorbing and emitting characteristics. Both the problems encountered and the methods developed to meet these problems are discussed. (Author)

AD-269 303 Div. 12
(TISTA/WAW) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
RE-ENTRY VEHICLE SYNTHESIS PROGRAM CALCULATION OF STRUCTURAL WEIGHTS.
by S. J. Morizumi and T. R. Thompson. 9 Jan 61, 11p. incl. illus. 3 refs. (Rept. no. STL/TN-61-0000-19003)
(Contract AF 04(647)619)
Unclassified report

DESCRIPTORS: (*Re-entry vehicles, *Airframes, Load distribution, Mathematical analysis, Synthesis, Simulation.)

The re-entry vehicle synthesis program is used for parametric studies of re-entry vehicles. It is intended to indicate generally the optimum (i.e., minimum weight) shapes for various missions, but is not used for detailed design calculations. The structural weights estimated by the existing program have been overly conservative, so a slightly more sophisticated method has been devised, using the same basic equations, which optimizes the design within the limitations of the program. The previous method assumed that each separate section of the body was a single conical shell stiffened at the end by a single stiffener ring. Each ring was presumed to support the pressure load acting on the rear half of the section which immediately preceded it. In the new program each section is divided up into a number of bays, each one stiffened by a ring. An iterative procedure is used to determine the number of bays which result in the minimum weight of structure. Both normal pressure and axial compression loads are considered. The resultant structure is checked against expected launch loads and peak normal re-entry loads (the basic design is made for peak axial deceleration). (Author)

AD-269 304 Div. 12
(TISTA/SEB) OTS price $8.10

Space Technology Labs., Inc., Los Angeles, Calif.
ORBITAL CONTROL AND ANALYSIS TECHNIQUES FOR EQUATORIAL 24-HOUR SATELLITES,
by Edward O. Gilbert. Aug 60, 74p. incl. illus. tables, 4 refs. (Rept. no. STL/TN-60-0000-27149)
Unclassified report

DESCRIPTORS: (Satellite vehicles, Satellite vehicle trajectories, *Satellite altitude, Orbital flight paths, Space navigation, Control systems, Thrust, Celestial mechanics, Perturbation theory, Motion, Errors, Correction, Mathematical analysis, Equations, Theory.)

Methods to implement such an orbital control function are described. The report is limited to the presentation of basic correction techniques and analytic methods. Emphasis is placed on minimizing or nearly minimizing total impulse requirements. Suitable coordinates for the problem and, using the linearized equations of motion, are derived unforced orbital motion in terms of the coordinates. Graphic portrayal of the motion is introduced to present clearly all characteristics of the motion. Orbit specifications are interrelated and tabulated. Important orbital perturbations caused by lunar and solar gravitational fields and earth oblateness are given. (Author)

AD-269 305 Div. 12
(TISTA/SEB) OTS price $8.60

Space Technology Labs., Inc., Los Angeles, Calif.
METHODS OF LONGITUDINAL CONTROL FOR 24-HOUR ORBIT SATELLITES,
by Thomas L. Gunckel, II. 10 Aug 60, 93p. incl. illus. tables (Rept. no. STL/TN-60-0000-27171)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Satellite attitude, *Orbital flight paths, Satellite vehicle trajectories, Drift, Velocity, Theory, Mathematical analysis.) (Gas generating systems, Rocket motors, Jets, Ejection, Thrust, Exhaust gases, Control systems.)

Two possible modes of longitudinal correction are discussed. One utilizes a unidirectional thrust capability and the other a bidirectional capability. A typical system will probably contain both capabilities with a hot gas engine providing the unidirectional thrust and a cold gas engine providing the bidirectional thrust. A discussion of the general problem and the sources of error are presented and a simplified model for the system is given. The unidirectional, or hot gas, system is described. A discussion is included of the fixed aiming point technique. The bidirectional, or cold gas, system is also described. (Author)

AD-269 307 Div. 12, 30
(TISTP/MFA) OTS price $2.60

Laboratories for Applied Sciences, U. of Chicago, Ill.
UNIVERSITY OF CHICAGO PROPORTIONAL COUNTER TELESCOPE EXPERIMENT FOR EXPLORER VI AND PIONEER V.
Final rept.
25 June 60, 20p. incl. illus. (Rept. no. STL/TR-60-0000-02166)
(Subcontract to Space Technology Labs., Inc., Los Angeles, Calif.)
Unclassified report

DESCRIPTORS: (*Instrumentation of Telescopes, *Satellite vehicles, Proportional counters, *Cosmic ray telescopes, Cosmic rays, Electron tubes.) (Van Allen radiation belt, Particles, Energy, Solar energy, Solar flares, Solar disturbances.) (Experimental data, Tests.) Radiation counters.

Contents:
Trapped and cosmic radiation measurements from Explorer VI
Structure of the trapped radiation
Solar induced changes
High-energy solar flare protons
A lower limit on the scale size for the modulation mechanism of galactic cosmic rays
Results from Pioneer V

AD-269 315 Div. 12
(TISTW/DLW) OTS price $10.10

Space Technology Labs., Inc., Los Angeles, Calif.
CONTROL SYSTEMS STUDIES.
Semiannual rept., 1 Jan-30 June 60, by Robert E. King. 30 June 60, 118p. incl. illus. tables, 59 refs. (Rept. no. STL/TR-60-0000-09204)
(Contract AF 04(647)309)
(AFBMD TR 60-99) Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Control systems, Electronic circuits, Switching circuits, Power supplies, Guided missile batteries, Fuel cells, Servo systems, Gyroscopes, Accelerometers, Monitors, Detectors, Servomechanisms, Reliability, Tests.)

Circuit studies were conducted for an advanced control system and some circuit units were packaged. Control sensors and power servos were investigated and tested. A battery evaluation program was continued and fuel cells were investigated. Advanced control systems, including a mercury hoop motor and a reaction wheel platform, were developed.

AD-269 344 Div. 12
(TISTW/MS) OTS price $6.60

Aerojet-General Corp., Sacramento, Calif.
BIBLIOGRAPHY OF RESEARCH AND DEVELOPMENT REPORTS.
Rept. on Weapon System 107A-2.
22 May 61. 63p. 719 refs. (Rept. no. LRP 106, rev. E)
(Contracts AF 04(645)8 and AF 04(647)521)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Bibliography.) (*Scientific research, Scientific reports.)

This bibliography applies to the Titan missile program. It lists research and development reports prepared under Contracts AF 04(645)-8 and AF 04(647)-521, and includes reports submitted by subcontractors, if applicable. Proposals and special reports are numbered in special series which include all such documents prepared and issued by the Liquid Rocket Plant, Aerojet-General Corporation. The documents in the other categories are numbered consecutively for this contract. Reports pertaining to costs, administration, construction progress, other contracts, and other fields not directly related to the technical progress of the program are excluded. (Author)

AD-269 348 Div. 12, 6, 18
(TISTW/EET) OTS price $13.00

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
SKYSCRAPER AIRBORNE INSTRUMENTATION SYSTEM LABORATORY TESTS.
1 Dec 61, 1v. incl. illus. tables (Scientific rept. no. 3; BSR-604)
(Contract AF 19(604)6129, Proj. 4904)
(AFCRL-1085) Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, Airborne, *Instrumentation for *Optical tracking, Tests.) (Infrared radiation, Measurement, Optical spectrometers, Radiometers.) (Servo systems, Calibration.) (Infrared detectors, Sensitivity, Tests in Laboratories.) (Tracking with Mirrors, Errors.) (Data processing systems, Display systems, Computers, Programming.) (Optical tracking of Guided missiles, Surface to surface, Airborne.) *Infrared optical systems.

Contents: Laboratory tests of system; Electrical and mechanical mating, Functional operation, Radiation measuring subsystem tests; Methods and results, Alignment of spectroradiometer with tracker, Foreoptics, Electronics, Mechanical components and controls, Spectrometers, Radiometers, Optical tracking subsystem test report; 10 in. optics and slit mirror tests, Servo system tests, Sensitivity test, Subsystem testing with all units on platform, Data handling subsystem tests; Computer input-output servo units, Pointing computer, and Data recording unit.

AD-269 366 Div. 12
(TISTW/EET) OTS price $26.00

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
FINAL COMPILATION OF TECHNICAL NOTES.
Final technical notes in the field of Aerodynamics and Ballistics, by John D. Nicolaides, 20 Nov 61, 1v.
Unclassified report

Division 12 - GUIDED MISSILES

DESCRIPTORS: (*Guided missiles, *Ballistics, *Aerodynamics, *Hydrodynamics, Guided missile trajectories, Flight paths, Dynamics, Yaw, Equations of Motion, Gravity, Roll, Space flight.)

A compilation of Technical Notes in the fields of aerodynamics, hydrodynamics, and ballistics is presented. Twenty-one Technical Notes, listed by number, title and author are included. Data covers the years from 1955 to 1958 and was prepared by the Bureau of Ordnance.

AD-269 413 Div. 12
(TISTA/WAW) OTS price $5.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
STABILITY OF CUSHIONED LUNAR LANDING.
Technical rept. on Flight Sciences,
by H. E. Lindberg. Sep 61, 43p. incl. illus.
5 refs. (Rept. no. 6-90-61-87)
Unclassified report

DESCRIPTORS: (*Lunar probes, Moon, Landing, Stability, Dynamics, Mathematical analysis.) (Shock, Absorption, Impact shock, Vibration isolators, Materials, Design.)

Stability against overturning is analyzed for a landing vehicle having a crushable pad fixed to its base as the landing device. The pad material is assumed ideally rigid-plastic and its uncrushed shape is that of a prism with annular cross section. The analysis is confined to planar motion of landings made on a sloping surface. Boundaries defining the regions of initial translatory velocities that result in stable landings are given for a class of examples of practical interest in which the vehicle is horizontal and nonrotating at initial contact. Several sets of vehicle and surface parameters are studied, centered about a vehicle with satisfactory characteristics for a soft lunar landing on a 15-degree slope. It is found that due to an initial angle between the pad and landing surface, a strip of instability tends to appear centered about a critical initial velocity normal to the surface. This situation is aggravated by increasing either the slope, the vehicle mass radius of gyration, the center-of-gravity height, or the pad-crushing stress. Drop tests and the numerical results of this study indicate that, even for realistic crushable materials, an analysis based on rigid-plastic material behavior gives a good indication of stability characteristics. (Author)

AD-269 416 Div. 12
(TISTW/RD) OTS price $4.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
AN ANALYSIS OF A TRAJECTORY AND VELOCITY MATCH TECHNIQUE FOR INTERCEPTING INTERCONTINENTAL BALLISTIC MISSILES.
Master's thesis,
by Richard Allen Coffland and Charles Allison MacIvor. Aug 61, 131p. incl. illus. tables, 14 refs. (Rept. no. GAW/Mech 61-2)
Unclassified report

DESCRIPTORS: (*Interception of Surface to surface, *Guided missiles.) (Equations of Motion for *Guided missile trajectories.) (Guided missile warheads, Flight paths.) (Interception of Guided missiles by Simulation of Velocity and Flight paths of Guided missile warheads.) Guided missile trajectories, Mathematical analysis, Partial differential equations, Antiaircraft defense systems.

A mid-course, trajectory-match intercept of intercontinental ballistic missiles is analyzed. The intercept is accomplished by using a multistage rocket to boost an interceptor vehicle onto a ballistic trajectory in the same direction of flight as the warhead trajectory, so that the two trajectories are almost tangent at a selected intercept point. Near the intercept point, a final rocket is ignited to accelerate the vehicle and match the warhead's position and velocity. A simplified analysis is performed for the case of a co-planar intercept over a spherical, nonrotating earth. Intercept trajectories are determined from the trajectory geometry and the rocket equations of motion. An approximate method is derived to estimate the thrusts and rocket weights required to boost an interceptor vehicle onto these trajectories. (Author)

AD-269 517 Div. 12, 1
(TISTA/WAW) OTS price $1.75

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
IN-FLIGHT SIMULATION OF THE LATERAL-DIRECTIONAL HANDLING QUALITIES OF ENTRY VEHICLES,
by Robert P. Harper, Jr. Nov 61, 53p. incl. illus. tables, 7 refs. (Rept. no. TE-1243-F-2)
(Contract AF 33(616)5823, Proj. 8219)
(WADD TR 61-147) Unclassified report

DESCRIPTORS: (*Re-entry vehicles, *Atmosphere entry, Re-entry aerodynamics, Stability, Maneuverability, Roll, Yaw, Dynamics, Control, Simulation by Jet planes, Jet training planes.) (Pilots, Human engineering, Handling, Control systems, Flight testing.)

The initial results of a flight research program to simulate the handling qualities of winged vehicles during atmospheric entry are discussed. The purpose is to evaluate in flight the effects on pilot-vehicle performance of the dynamic flight characteristics of atmospheric entry vehicles, and to determine their suitability for the entry mission. The evaluations were conducted in a three-axis variable stability T-33 airplane. Different sets of handling characteristics were evaluated in maneuvering flight and rated as to their suitability for the entry mission. Emphasis was placed upon the lateral handling characteristics, and 129 configurations were examined by one pilot. An effort is made to relate pilot objections and the attendant poor ratings to their causative vehicle characteristics. The piloting difficulties involved in the control of vehicles with either static or dynamic directional instabilities are discussed. (Author)

AD-269 559 Div. 12
(TISTA/SEB) OTS price $8.60

Lockheed Aircraft Corp., Burbank, Calif.
STUDY ON MINIMIZATION OF FIRE AND EXPLOSION HAZARDS IN ADVANCED FLIGHT VEHICLES.
Rept. for June 60-Aug 61 on Design Criteria for Fire and Explosion Hazards in Advanced Flight Vehicles.
Oct 61, 186p. incl. illus. tables, 151 refs.
(Rept. no. 15156)
(Contract 33(616)7387, Proj. 6075)
(ASD TR 61-288) Unclassified report

DESCRIPTORS: (Supersonic planes, Spaceships, Satellite vehicles, Manned, *Aircraft fires, *Aviation safety, Electrical equipment, Aviation fuels, Rocket fuels, Rocket oxidizers, Liquid rocket propellants, Solid rocket propellants, Materials, Hazards, Fires, Explosions, Spark ignition, Reliability, Safety, Physiology.) (Fire extinguishers, Fire detectors.)

A study is presented of potential fire and explosion hazards in advanced flight vehicles and design criteria for enhancement of safety and reliability of the vehicles. The vehicles cover the range between Mach 3 airplanes and long time, long range space vehicles, however the design criteria may be applied to all flight vehicles as they are currently known to be conceived or built. (Author)

AD-269 587 Div. 12
(TISTA/SEB) OTS price $4.00

Space and Information Systems Div., North American Aviation, Inc., Downey, Calif.
SPACE RADIATOR ANALYSIS AND DESIGN. PART I,
by D. B. Mackay and C. P. Bacha. Oct 61, 287p. incl. illus. tables, refs. (Rept. no. SID 61-66)
(Contract AF 33(616)7635, Proj. 6146)
(ASD TR 61-30, pt. 1) Unclassified report

DESCRIPTORS: (Spaceships, Satellite vehicles, *Radiators, Radiant heating panels, Metal plates, Refrigerant condensers, Heat, Temperature control, Heat transfer, Heat exchangers, Convection, *Thermal radiation, Design, Configuration, Effectiveness, Mathematical analysis, Military requirements.)

The thermal analysis of component elements of space radiators is described. Elements include rectangular and circular plates of uniform thickness, triangular and trapezoidal fins, and constant temperature-gradient fins. A complete condenser and a radiator are analyzed and illustrative examples given. The thermal analyses produced relationships between the physical properties and dimensions, element and environmental temperatures, and rates of heat transfer. These are shown graphically for all types of elements. The optimum proportions of space radiator elements having the greatest ratio of heat radiation rate per pound of weight are also indicated graphically, and procedures for their calculation are shown. The discussions on condensers and radiators include dimensional-thermal relationships and weight-optimizing procedures for complete units. (Author)

AD-269 614 Div. 12, 22
(TISTW/JRG) OTS price $10.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INTRODUCTION TO ROCKET TECHNOLOGY (Vvedeniye V Raketnuyu Tekhniku),
by V. I. Feodosyev and G. B. Sinyarev. 23 Aug 61, 135p. incl. illus. tables (Trans. no. MCL-901/1 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Oborongiz, Moskva, pp. 44-48, 58-84, 167-176, 211-236, 460-486, 1960)
Unclassified report

DESCRIPTORS: (*Rocket research, *Guided missile research.) (*Guided missiles, *Booster rockets, *Rockets, Rocket assisted projectiles, Antiaircraft ammunition, Aircraft ammunition, Aircraft torpedoes, Fragmentation ammunition, Underwater rockets, Design, Launching.) (*Rocket propellants, Liquid rocket propellants, Solid rocket propellants, Propellant grains, Combustion, Chemical properties, Physical properties, Thermodynamics.) (Rockets, Combustion chambers, Exhaust gases, Dissociation.) (Guided missiles, Rockets, Launching, Launching sites, Ground support equipment.) *Sounding rockets, Rocket igniters, USSR.

AD-269 628 Div. 12, 9
(TISTA/WAW) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
HEAT EXCHANGE AT THE FRONTAL POINTS OF BLUNT BODIES WASHED BY A SUPERSONIC GAS FLOW,
by V. P. Motulevich. 7 Aug 61, 16p. incl. illus. (Trans. no. MCL-1108/1 of Konvektivnyy i Luchistyy Teploobmen, Moscow, pp. 16-24, 1960)
Unclassified report

DESCRIPTORS: (*Blunt bodies, Aerodynamics, Supersonics, Aerodynamic heating, Heat transfer, Mathematical analysis, USSR.)

AD-269 640 Div. 12, 2
(TISTA/VGW) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE DAWN OF THE SPACE AGE. GENERAL MEETING OF THE ACADEMY OF SCIENCES, USSR, DEVOTED TO THE FIRST MANNED SPACE FLIGHT,
by M. Keldysh and A. A. Blagonravov. 17 Aug 61, 11p. (Trans. no. MCL-1252/1 of Pravda, 3p., 20 May 61)
Unclassified report

DESCRIPTORS: (Manned, *Space flight, Satellite vehicle research, Guided missile research, Satellite vehicles, Lunar probes, Space probes, Venus, Geophysics, Upper atmosphere, Ionosphere, Ionosphere models, Atmosphere, *Astronautics, Astrophysics, USSR.)

AD-269 645 Div. 12
(TISTA/SEB) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INTERPLANETARY ROUTES,
by A. Shternfel'd. 17 May 61, 7p. incl. illus. (Trans. no. MCL-1264/1 of Krasnaya Zvezda 38:6p., 1961)
Unclassified report

DESCRIPTORS: (Spaceships, *Space flight, Space probes, Booster rockets, Launching, Space navigation, Flight paths, Navigation, Velocity, Theory, Analysis.) USSR.

Spaceflight is discussed in terms of rocket boosters, launching velocity, flight duration, flight trajectories, optimum launching time, and launching delays and errors.

AD-269 648 Div. 12, 2
(TISTA/VGW) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
OUR NEAREST COSMIC NEIGHBOR,
by N. Varvarov. 17 Aug 61, 6p. (Trans. no. MCL-1270/1 of Ekonomicheskaya Gazeta 116: 4p. 18 May 61)
Unclassified report

DESCRIPTORS: (Moon, Landing, *Lunar probes, USSR.)

The moon is being studied by scientists and engineers in many scientific and technical fields. A new period has begun in the biography of the moon. On 14 September 1959 the second Soviet cosmic rocket reached its surface. The third Soviet cosmic rocket was launched on the morning

of 4 October 1959. Using a photographic television apparatus it photographed the far side of the moon and transmitted the image to earth. Further steps in the study of the moon will be the development of artificial lunar satellites which will be able to maintain radio and TV contact with the earth; the making of a soft (non-impact) landing on the moon's surface with rockets carrying various scientific-research apparatus; a round-trip rocket flight to the moon and finally the organization of cosmic ship flights to the moon with researchers on board. (Author)

AD-269 725 Div. 12, 25
(TISTA/WAW) OTS price $1.60

Westinghouse Electric Corp., Baltimore, Md.
ORBITS WITH FIXED LOW THRUST,
by George Shapiro. 30 Nov 61, 8p.
(Contract AF 49(638)1002)
(AFOSR-1823) Unclassified report

DESCRIPTORS: (Satellite vehicles, Satellite vehicle trajectories, *Orbital flight paths, Thrust, Mathematical analysis.)

The method of Krylov-Bogoliuboff is used to analyze orbits with an additional low thrust in a fixed direction in the orbit plane. Algebraic formulas for orbital elements are obtained. It is shown that eventually the orbital eccentricity increases to 1 with the orbit approaching a straight line through the center of the earth. However, in a practical case, it is likely that collision would occur before escape. (Author)

AD-269 791 Div. 12, 10, 27
(TISTA/LH) OTS price $6.60

Aerospace Information Div., Washington, D. C.
USSR MISSILE AND ROCKET PROGRAM BIBLIOGRAPHY.
14 Dec 61, 66p. (AID rept. 61-12)
Unclassified report

DESCRIPTORS: (*Bibliography, *USSR, *Space flight, Extraterrestrial bases, Guided missiles, Rockets, Propulsion, Propellants.)

AD-269 794 Div. 12
(TISTB/LH) OTS price $1.60

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS.
30 Nov 61, 10p. 17 refs. (AID rept. 61-156)
Unclassified report

DESCRIPTORS: (*Scientific reports, *USSR, *Space flight, Manned, Laboratory animals.) (Closed-cycle ecological systems, Stress (Physiology), Stress (Psychology), Weightlessness, Radiation effects, Radiation damage, Telemetering data.)

AD-269 795 Div. 12, 6, 2
(TISTW/DLW) OTS price $1.60

Aerospace Information Div., Washington, D. C.
TRACKING OF MISSILES AND SPACE VEHICLES. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 15, Oct-Nov 61.
12 Dec 61, 8p. 8 refs. (AID rept. 61-161)
Unclassified report

DESCRIPTORS: (*Plasma physics, Electromagnetic properties, *Ionospheric disturbances, Ions, Meteors, Electrons, Density, Ionosphere, Upper atmosphere, Molecules, *Radio astronomy, Extraterrestrial radio waves, Scientific research.) (Satellite vehicles, Guided missiles, Surface to surface, Radar tracking, Radio interferometers, Tracking.) USSR.

Contents:
Electromagnetic problems
- Absorption of cyclotron oscillations in a non-homogeneous plasma

Ion clouds and ionosphere perturbations
- The motion of meteor bodies in the earth's atmosphere
- Fluctuations in the electron density in the ionosphere
- Formation of ions in the upper atmosphere
- Formation of molecular ions in the upper atmosphere

Radioastronomy
- Radio emission from the Taurus-A region on the 8-mm wavelength
- Radioastronomical observations of Soviet space rockets
- Radar determination of orbits of individual meteors

AD-269 818 Div. 12
(TISTA/SEB) OTS price $18.50

Aerojet-General Corp., Azusa, Calif.
RESEARCH STUDY TO DETERMINE PROPULSION REQUIREMENTS AND SYSTEMS FOR SPACE MISSIONS. VOLUME III. MISSION STUDIES.
Final rept., 1 Feb-31 Oct 61.
Dec 61, 1v. incl. illus. tables, 24 refs.
(Rept. no. 2150, vol. 3)
(Contract NAS 5-915)
Unclassified report

DESCRIPTORS: (*Space probes, *Lunar probes, *Space flight, Spaceships, Satellite vehicles, Manned, Booster rockets, Rocket motors, Control systems, Flight paths, Rocket propulsion, Rocket propellants, Storage, Specific impulse, Thrust, Military requirements, Theory, Mathematical analysis, Mathematical prediction.)

Propulsion requirements and criteria, selection and evaluation of alternate propulsion systems, and specifications of integrated conceptual system designs are reported for each of the several space missions specified for further study by NASA at the completion of Phase I (AD-268 631 and AD-268 362) of the study. Particular attention is given to lunar missions and 24-hr satellite missions. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-269 069 Div. 13
(TISTA/VGW) OTS price $2.25

Midwest Research Inst., Kansas City, Mo.
AUTOMATIC RUNWAY PROFILE MEASURING INSTRUMENTA-

TION AND RUNWAY PROPERTIES. PART II. EQUIPMENT TRIALS.
Rept. for Apr 60-Feb 61 on Structural Design Criteria.
Oct 61, 76p. incl. illus.
(Contract AF 33(616)6512, Proj. 1367)
(WADD TR 60-470, pt. 2) Unclassified report

DESCRIPTORS: (Landing fields, *Runways, Surfaces, Configuration, Automatic, Measurement.) (*Collimators, Optical equipment, Recording systems, Data storage systems, Instrumentation, Digital computers, Mathematical analysis, Tests.)

The methods and techniques to efficiently use the runway profile measuring instrumentation were developed. The computer program was written and used to reduce profile data taken from several Air Force bases to power spectral density form. A summary of the analytical techniques used and plots of the power spectral density curves and runway profiles are appended. (Author)

AD-269 507 Div. 13, 12, 4
(TISTM/EJH) OTS price $2.50

Battelle Memorial Inst., Columbus, Ohio.
STUDY OF A CARBON DIOXIDE REDUCTION SYSTEM.
Rept. for 1 May 59-31 Dec 60 on Equipment for Life Support in Aerospace,
by John F. Foster and Justin S. McNulty. Aug 61, 104p. incl. illus., tables, 18 refs.
(Contract AF 33(616)6332, Proj. 6373)
(ASD TR 61-388) Unclassified report

DESCRIPTORS: (*Carbon dioxide, *Decomposition, *Reduction, High temperature research, Radiation effects, Photochemistry, Alkali metals, Alkali metal compounds, Hydrides, Hydrogen, Catalysis, Catalysts, Iron, Water, Separation, Carbon deposits.) (Water, Electrolysis.) (Spaceships, Satellite vehicles, *Air conditioning equipment, Production, Oxygen.)

An engineering model of a system for reducing CO2 at a rate of 500 cc/min by reaction with H over heated catalysts was developed. The primary products of the reaction were solid C and water vapor. To recover breathable O, condensed water vapor would be fed to an electrolysis cell; the H by-product of the electrolysis would then be used to reduce more CO2. Solid carbon is removed periodically from the apparatus and discarded. In the final test, the apparatus was operated continuously for a period of 11 hr. at about 10% above the target conversion rate. We estimate that the C deposits could be accumulated for at least 2 days in the present reactor before interrupting the process for removal of C and renewal of catalyst. With appropriate maintenance procedures, the apparatus should operate for the specified maximum of 3 yr without difficulty. (Author)

AD-269 671 Div. 13
(TISTW/EET) OTS price $3.60

Ohio River Div. Labs., Engineer Corps., Cincinnati.
DEVELOPMENT OF RIGID PAVEMENT THICKNESS REQUIREMENTS FOR MILITARY ROADS AND STREETS,
by P. F. Carlton. July 61, 32p. incl. illus. tables, 12 refs. (Technical rept. no. 4-18)
Unclassified report

DESCRIPTORS: (*Pavements of *Roads in *Military facilities.) (Design of Concrete, Pavements, Thickness, Load distribution, Traffic, Effectiveness.)

A new procedure was developed for the design of rigid pavements for roads and streets at military installations. The purpose was to provide greater flexibility in the design procedure to include the effects of: vehicle loading, vehicle type, wheel configuration, and volume off traffic. By expressing all types of vehicular traffic in terms of an equivalent number of applications of an 18,000 pound load on a single axle equipped with dual wheels, the variables in determining the required pavement thickness are produced to: the total number of load applications, the flexural strength of the concrete, and the modulus of subgrade reaction. Development of the design procedure is described in detail. Application of the method to the design of military roads and streets is illustrated by example. (Author)

AD-269 676 Div. 13
(TISTW/EET) OTS price $2.60

Army Armor Board, Fort Knox, Ky.
SERVICE TEST OF BULLDOZER, EARTHMOVING, TANK MOUNTING, M9,
14 Dec 61, 31p. incl. illus. (Proj. no. 2173)
Unclassified report

DESCRIPTORS: (Installation of *Earth moving equipment, *Bulldozers on Tanks.) (Bulldozers, Operation, Maintenance, Reliability, Tests.)

Tests were conducted to determine the suitability of the M9 bulldozer and its maintenance package for use with the M60 tank. It was concluded that the test item is suitable for use with the M60 tank when certain deficiencies are corrected. (Author)

AD-269 793 Div. 13, 29, 17, 2
(TISTB/LH) OTS price $3.60

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
SOVIET LITERATURE ON PROTECTIVE STRUCTURES AND COMPONENTS.
Quarterly rept. no. 3, 31 May-15 Oct 61.
28 Nov 61, 30p. incl. illus. 17 refs. (AID rept. 61-155)
Unclassified report

DESCRIPTORS: (*Scientific reports, *USSR, Protective coverings, *Shelters, Railroads, Construction, Geophysics, Mining engineering, Industrial plants, Propellants, Handling, Liquefied gases, Oxygen.)

14. MATERIALS (NON-METALLIC)

AD-269 132 Div. 14, 17
(TISTM/REB) OTS price $.75

National Bureau of Standards, Washington, D. C.
COATINGS FOR REFRACTORY METALS, FORMED BY ANODIC TREATMENT AND BY VAPOR DEPOSITION.
Rept. for Mar 59-Feb 61 on Finishes and Materials Preservation,
by Vernon A. Lamb and John L. Sligh. Sep 61, 20p. incl. illus. tables, 28 refs.
(Contract AF 33(616)60-2, Proj. 7312)
(WADD TR 61-64) Unclassified report

Division 14 - MATERIALS (NON-METALLIC)

DESCRIPTORS: (*Coatings, *Oxidation inhibitors, *Refractory materials, Niobium, Tantalum, Molybdenum, Tungsten, Electrodeposition, Vapor plating, Anodes (Electrolytic cell).) (Oxides, Aluminum, Silicides, Chromium plating.) High temperature research.

Preparation of anodic coatings on Nb, Ta, Mo, and W was investigated. The object was to modify such coatings by anodically incorporating elements known to form oxidation protective alloys with these refractory basis metals, and to convert the mixed coatings to a high-temperature oxidation protective film by subsequent reduction and sintering. Anodizing was carried out in both aqueous solutions and in molten salts. Successful coatings were not obtained. Attempts to form aluminide coatings by diffusion of electrodeposited Al, followed by anodizing, were also unsuccessful. Efforts were turned to the preparation of coatings by combining electrodeposition and vapor deposition. Chromium silicide coatings, formed by vapor phase siliciding of electrodeposited Cr, were investigated. Sound coatings were not obtained from hydrogen reduction of $SiCl_4$ due to chemical displacement reaction with the basis Cr. Siliciding with monomethyl and tetramethyl silane avoided the displacement reaction and yielded sound silicon carbide coatings. However, these coatings failed to provide good oxidation protection at 1100 C in air, due to spalling. The differential thermal coefficient of expansion with respect to the basis metal was the probable cause of failure. (Author)

AD-269 145 Div. 14, 17, 25
(TISTM/EJH) OTS price $4.60

Alfred U., N. Y.
THE FRACTURE ANALYSIS OF ALUMINA USING THE ELECTRON MICROSCOPE.
Final rept.,
by D. Tunison and V. Burdick. 30 Nov 61, 35p. incl. illus. table, 28 refs.
(Contract Nonr-240700, Proj. NR 032-022)
Unclassified report

DESCRIPTORS: (*Fracture (Mechanics), Crystals, *Aluminum compounds, *Oxides, Impurities, Microstructure, High temperature research, Stresses, Mechanical properties, Test methods, Electron microscopy.) (Grinding wheels, Materials, Grains (Metallurgy), Thermal conductivity.)

A model system of pure hot pressed Al_2O_3 was used to study the effect of temperature on the transverse strength and type of fracture in polycrystalline material. The type of fracture depends upon the relationship of crystalline to intercrystalline bond strengths. In particular, it was found that these strengths were equal in hot pressed Al_2O_3 at very nearly 1200 C. This is called the equicohesive temperature. The transverse strength decreased rapidly above the equicohesive temperature where the fracture was entirely intergranular. Samples of fused Al_2O_3 made directly from bauxite were studied with the aid of the electron microscope and the metallograph to relate the abrasive character of three types of this product to its microstructure. It was speculated that for high pressure grinding wheels of agglomerated fine grained Al_2O_3 would give a lower breakdown rate than the same sized monocrystalline grit used in a bonded abrasive wheel. (Author)

AD-269 171 Div. 14, 30, 27
(TISTM/EJH) OTS price $1.25

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
ACCELERATED STORAGE STABILITY TESTS,
by Eldred N. Cart, Jr. Sep 61, 41p. incl. illus. tables, 6 refs.
(Proj. 3044)
(ASD TR 61-144) Unclassified report

DESCRIPTORS: (Jet engines, *Airplane engine oils, *Oils, *Lubricants, Hydraulic fluids, Storage, Deterioration, Water, Additives, Amines, Tests, High temperature research.) (Lead, Corrosion, Test methods, Test equipment, Ovens.) (Butyl radicals, Methyl radicals, Amines, Cresyl radicals, Hydroxides.)

The storage life of MIL-L-7808 oils was improved by the use of amine type additives. The accelerated storage tests used to arrive at qualification limits are described. The time-temperature relationships for the storage life of MIL-L-7808 oils are given. From these relationships, the storage life can be estimated at any temperature from data at one given temperature. (Author)

AD-269 177 Div. 14, 26
(TISTM/EJH) OTS price $4.60

Armour Research Foundation, Chicago, Ill.
INVESTIGATION OF GLASS FIBER STRENGTH ENHANCEMENT THROUGH BUNDLE DRAWING.
Quarterly rept. no. 3, 7 July-6 Oct 61,
by N. A. Weil and J. S. Islinger. Nov 61, 37p. incl. illus. tables, 39 refs.
(Contract NOw-61-0259-c)
Unclassified report

DESCRIPTORS: (Brittle materials, Glass, Fibers, *Glass textiles, *Ceramic fibers, Coatings, Mechanical properties, Theory, Metal coatings, Lead alloys, Indium alloys, Aluminum alloys, Silicon alloys.) (Manufacturing methods, *Drawing (Machine processing), Industrial equipment.)

Contents:
Modifications to fiber drawing apparatus
Fiber drawing experiments
Procurement of E-glass rods
Theoretical analyses of the strength of glass

AD-269 386 Div. 14, 1
(TISTM/GEC) OTS price $3.50

McGraw-Hill Book Co., Inc., New York.
HANDBOOK OF FIBROUS MATERIALS.
Rept for Aug 60-Aug 61 on Materials Applications,
by Walter S. Baker and Ernest R. Kaswell.
Oct 61, 195p. incl. illus. tables, 26 refs.
(Contract AF 33(616)7504, Proj. 7381; In cooperation with Fabric Research Labs. Inc.)
(WADD TR 60-584, pt. 2)
Unclassified report

DESCRIPTORS: (*Handbooks, *Textiles, *Synthetic fibers, *Fibers, Cordage, Nylon, Dacron, Deceleration, Parachute fabrics, Coatings.) (Physical properties, Mechanical properties, Porosity, Semipermeability, Climatic factors, Radiation effects, Temperature, Aerodynamic heating, Cooling, Aging, Friction.) *Bibliography.

Contents: Aging properties; Design data, basic; Friction, abrasion, wear; Impact loading; Porosity and air permeability; Sewability; Sunlight and weather resistance, Temperature properties; Chemical resistance; Radiation properties; Aerodynamic heating.

AD-269 554 Div. 14, 17
(TISTB/LH) OTS price $9.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ANTENNA AND RADOME MATERIALS AND PROPERTIES FOR SPACE AND SATELLITE USE. AN ANNOTATED BIBLIOGRAPHY.
Addendum to the Space Materials Handbook, comp. by George R. Evans. Oct 61, 109p. (Special bibliography no. SB-61-45; rept. no. 3-34-61-9)
(Contract AF 04(647)673)
Unclassified report

DESCRIPTORS: (*Bibliography, *Space environmental conditions, *Materials for Electronic equipment, *Antennas, *Radomes, Dielectric properties, Mechanical properties, Physical properties, Radiation damage.)

The scope of the search was to provide information on airborne antenna systems applicable to a space environment. Areas of interest include antenna and radome design and materials suitable for their construction, dielectric properties of the materials, and possible space environment effects on the various properties of the materials. (Author)

AD-269 577 Div. 14, 22
(TISTM/TCG) OTS price $1.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
BALLISTIC PROTECTIVE BUOYANT MATERIALS.
Quarterly rept. no. 7, 1 July-30 Sep 61, by M. C. Jaskowski. 8 Jan 62, 12p. incl. illus.
(Contract N140(138),68879B, Proj. 388-2)
Unclassified report

DESCRIPTORS: (*Buoyant materials, *Protective clothing, Terminal ballistics.) (Fibers, Synthetic fibers, Textiles, *Dacron, *Orlon, *Nylon, Resins, Acrylic resins, Flotation, Cleaning.) (Fragmentation, Penetration, Tests.) (*Body armor, Materials.)

Orlon needled batts which were commercially processed were ineffective buoyantly. Additional curing upgraded the material slightly; but a substantial increase in the buoyancy was obtained by compartmentation (using 6-in. strips of the Orlon batt separated by plastic film to form larger sections). The effect of various surface finishes on the ballistic performance of 42 oz/sq yd batts containing Orlon staple was investigated. The 3 finishes studied were the manufacturer's original anti-static agent, hydrophobed Aerogel and Decetex-104 silicon water-repellent. The ability of the batts to withstand fragment penetration increased as the fiber-to-fiber friction decreased. A comparison of the ballistics of 2 types of Dacron staples, hydrophobed, was obtained. Type 5400 was vastly superior to Type 64. A 50/50 blend of hydrophobed Acrilan and Dacron was equal ballistically to a 50/50 composite of the same materials. (Author)

AD-269 593 Div. 14
(TISTM/EJH) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
NOL RING TEST EVALUATION OF THREE HIGH MODULUS GLASS FIBERS,
by P. W. Erickson, F. Robert Barnet and others. 5 June 61, 14p. incl. illus. tables, 3 refs.
(Rept. no. NOLTR 61-55)
Unclassified report

DESCRIPTORS: (*Plastics, Reinforcing materials, *Glass textiles, *Ceramic fibers, Fibers, Filament wound construction, Rings, Mechanical properties, Tensile properties, Shear stresses, Tests.) (Epoxy resins, Resins, Manufacturing methods, Test methods.)

Data on the strength properties of glass roving reinforced plastics is discussed. Experimental glass formulations were used in the preparation of test specimens which were evaluated by the series of NOL Ring Test methods. Results show that much progress was made in the development of higher modulus fibers for reinforced plastics. A tensile modulus of 13.4 x 10 to the 6th power psi was obtained with YM-31-A in a ring. Calculated to a 100% glass basis, the modulus of the glass was 17.6 x 10 to the 6th power psi, which compares well with 17x 10 to the 6th power psi reported in literature. (Author)

AD-269 603 Div. 14, 4, 1
(TISTM/EJH) OTS price $7.60

Midwest Research Inst., Kansas City, Mo.
HIGH TEMPERATURE RESISTANT TRANSPARENT PLASTICS.
Final rept., 15 Feb-14 Oct 61, by Howard Christie and Thomas Medved. 31 Oct 61, 63p. incl. illus. tables, 10 refs.
(Contract NOw 61-0673-d; Continuation of Contract NOa(s) 60-6099-c)
Unclassified report

DESCRIPTORS: (*Transparent panels, *Optical materials, *Optical plastics, *Optical coatings, *Heat resistant polymers, *Epoxy resins, Acrylic resins, Resins, Plastics.) (Phthalic acids, Anhydrides, Vinyl radicals, Cyclohexenes, Dioxides.) (Epoxides, Heterocyclic compounds, Processing, Aging, Synthesis.) (Ultraviolet radiation, Radiation damage, Light transmission, Mechanical properties, Aircraft finishes, Supersonic planes.) High temperature research.

Purification of the diglycidyl ether of bisphenol A (DEBA) by vacuum distillation and decolorization of the trimethoxyboroxine (TMB) catalyst produced colorless starting materials. Reaction of these materials produced a water-white resin. After curing in vacuum, the 0.25 in. thick castings had a luminous transmission of 88%. Small quantities of low color epoxy novolac resin were obtained by molecular distillation of a commercial product. The distillate reacted rapidly with TMB to form a hard solid with much lower color than obtained from any previous resin of this type. Cast resins obtained from hexahydrophthalic anhydride and vinylcyclohexene dioxide were extremely notch sensitive and brittle. (Author)

AD-269 653 Div. 14
(TISTM/BRW) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE PROTECTION OF CARBON AND GRAPHITE AGAINST OXIDATION AT TEMPERATURES OF 1200 DEGREES,
by M. V. Sazonova, A. Ya. Sitnikova, and A. A. Appen. 17 Aug 61, 13p. incl. illus. tables, 8 refs. (Trans. no. MCL-1285/1 of Zhurnal Prikladnoy Khimii 34:505-512, 1961)
Unclassified report

DESCRIPTORS: (*Antioxidants, *Ceramic coatings, *Oxidation inhibitors, *Refractory coatings for *Graphite, *Carbon.) (Coatings, Titanium compounds, Silicides, Molybdenum compounds.) (Silicon compounds, Nitrides, Oxides, Carbides.) (Tests, Test methods, High temperature research, USSR.) (Refractory materials, Wetting agents, Bonding.)

High-quality glassy silicidic coatings to protect various types of carbon-graphite materials from oxidation at 1200C for more than 100 hr were developed. The composition of the bonding agents greatly influenced the properties of the coatings. These properties were controlled by changing the composition of the bonding agents. When studying wettability, data obtained by the drop-spread method did not solve the problem of the suitability of a bonding agent for heterogeneous coatings. The method of the preliminary application of powdered-glass dross to the surface of the samples made it possible to derive more correct conclusions on the applicability of glass as a bonding agent for coatings. (Author)

AD-269 721 Div. 14, 8
(TISTM/TCG) OTS price $7.60

Rutgers U. School of Ceramics, New Brunswick, N. J.
DEVELOPMENT OF REFRACTORY CERAMICS THAT CAN BE PROCESSED AT TEMPERATURES CONSIDERABLY LOWER THAN THEIR MAXIMUM USE TEMPERATURE.
Quarterly progress rept. no. 4, 1 Sep-1 Dec 61, by E. J. Smoke, Peter L. Fleischner and Chester Ringel. 1 Dec 61, 67p. incl. illus. tables.
(Contract NOw-61-0211-c)
Unclassified report

DESCRIPTORS: (*Radomes, Materials, Processing, Temperature.) (*Refractory materials, *Ceramic materials, Aluminum compounds, Magnesium compounds, Chromium compounds, Titanium compounds, Silicon compounds, Oxides, Mixtures, Glass, Silicates, Lead compounds, Crystal structure.) (Aluminum compounds, Oxides, Oxychlorides.) (Preparation, Processing, Sintering.) (Physical properties, Density, Porosity, Electrical properties, Dielectric properties.)

An evaluation of the strength, electrical properties, and refractoriness of bodies fabricated containing 94% Al2O3 utilizing different forms of the MgO additive is presented. Alumina bodies in the alumina-chromia-titania, alumina-chromia, and alumina-chromia-silica systems were fabricated. Introduction of the devitrifiable glass, lead aluminosilicate, into an alumina matrix was investigated. The effect of longer soaking period upon density was also studied. (Author)

AD-269 722 Div. 14, 17
(TISTM/TCG) OTS price $6.60

Republic Aviation Corp., Farmingdale, N. Y.
COMPILATION OF UNPUBLISHED MATERIALS INFORMATION.
Semi-annual rept. no. 1, Apr-Sep 61.
12 Oct 61, 56p. (Rept. no. RAC 357-2)
(Contract AF 33(616)8084, Proj. 1(8-7381))
Unclassified report

DESCRIPTORS: (*Materials, *Refractory materials, *Ceramic materials, Coatings.) (*Plastics, Expanded plastics.) (*Bearings, Lubrication.) (*Plasma jets, Gas discharges.) (Fluids, Seals, Sealing compounds.) (*Metals, Oxides.) (*Alloys, Aluminum alloys, Titanium alloys, Nickel alloys, Magnesium alloys, Molybdenum alloys.) (Corrosion, Fatique (Mechanics), Fracture (Mechanics), Stresses.) (Welding, Welded joints.)

Contents:
Metallics, plasma, steel, super alloys
Refractory metals, metals and oxides
Coatings, aluminum, titanium, nickel
Plastics, sandwich, seals, fluids and sealants
Bearings, magnesium, molybdenum
Ceramics, fatigue, corrosion, strain measurements

AD-269 733 Div. 14, 25
(TISTM/GEC) OTS price $12.00

Synthetic Mica Corp., Clifton, N. J.
SYNTHETIC MICA CRYSTAL GROWTH PROGRAM.
Final technical engineering rept., 8 Apr 58-4 Apr 61,
by S. Rodney, F. A. Barr and E. C. Worden.
May 61, 1v. refs.
(Contract AF 33(600)36853, Proj. 7-674)
(ASD TR 61-7-674) Unclassified report

DESCRIPTORS: (*Mica, Single crystals, Growth, Manufacturing methods, *Mica capacitors, *Capacitors, Zone melting, Crystallization from Solutions, Glass, Solvent action, Heat treatment, Dielectric properties.) (Crystals, Thickness, Ultrasonics, Shock tubes.)

Various crystal growing techniques were investigated as possible means of producing large size single crystals of synthetic mica (fluorphlogopite type) on a commercially feasible basis. Methods included crystal pulling, zone melting, and growth from solution. Most favorable results were obtained from a progressive internal resistance melting using zone melting principles, however, no method was found for delamination of the crystal books. Crystal pulling techniques were unsatisfactory. Zone melting, using inductive heating, produced crystals with good orientation, but crystal size was small. Progressive melting, using the internal resistance method of heating produced the largest crystals. Relatively large percentages of such crystals were obtained within a melt. These crystals were larger than those produced by standard production techniques. Crystals of synthetic mica can be grown from a solution using glass as a solvent. (Author)

AD-269 785 Div. 14, 4
(TISTM/BRW) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
HIGHLY CHLORINATED MATERIALS FOR OXIDATION- AND HEAT-RESISTANT PLASTICS.
30 Nov 61, 1p. (AID rept. 61-160 of Chlorinated Insecticides Based on Hexachlorocyclopentadiene; Khimicheskaya Promyshlennost' 10:8-13, Oct 61)
Unclassified report

DESCRIPTORS: (*Heat resistant polymers, Materials, *Cyclopentenes, Chlorides, Polymers, Synthesis, Chlorination, USSR.)

The text of the article which contains a brief outline of methods for obtaining hexachlorocyclopentadiene, is documented by more than 60

references, many of which are Soviet. The work by L. M. Kogan and others cited dates from 1958 through 1961. The part of the article dealing with hexachlorocyclopentadiene is representative of Soviet interest in highly chlorinated polymers because of their heat and oxidation resistance. An improvement in the technology of another highly chlorinated monomer, chlorendic anhydride, was reported previously. (Note: This abstract virtually comprises the entire report). (Author)

AD-269 830 Div. 14, 26
(TISTM/TCG) OTS price $6.60

Burke Research Co., Pompano Beach, Fla.
SURFACE APPLICATION OF ANTIOZONANTS TO RUBBER ITEMS AND EVALUATION OF ANTIOZONANTS FOR PACKAGING RUBBER ITEMS IN PLASTIC BAGS.
Final technical rept., 1 June 60-17 Nov 61, by E. E. Stahly and B. P. Hunt. 1 Dec 61, 60p. incl. illus. tables.
(Contract DA 20-018-ORD-22837)
Unclassified report

DESCRIPTORS: (Ozone, *Oxidation inhibitors, Coatings for *Rubber, Rubber coatings, Storage in Plastics, Containers, Polymers, Ethylenes, *Packaging.) (Processing from Solutions or Vapor plating, Test methods.) (Hazards, Toxicity.) (Additives, Amines, Nitrites, Thiourea, Quinolines, Quinones, Sulfides.) *Antioxidants.

Research was conducted to develop methods of surface applications of antiozonants to rubber items and evaluate antiozonants for packaging rubber items in plastic bags. The report covers (1) tests of packaging rubber items in polyethylene bags together with various antiozonants, and (2) tests of surface-coated samples, wherein the coatings were applied either by exposure to vapors or by dip-coating from solutions. The vapor exposure method is believed to carry a minimum of toxicity and fire hazard, no drying time, and good protection against ozone attack; these conditions approach those obtained with the more hazardous solution dipping method. (Author)

AD-269 833 Div. 14, 25
(TISTM/TCG) OTS price $2.60

Borden Co., Pa.
STUDY LEADING TO THE DEVELOPMENT OF HIGH TEMPERATURE RESISTANT ADHESIVES.
Quarterly progress rept. no. 1, 1 July-30 Sep 61, by K. C. Tsou, J. Dickstein and B. D. Halpern. 30 Sep 61, 17p. incl. illus. table, 7 refs.
(Contract DA 36-034-ORD-3501)
Unclassified report

DESCRIPTORS: (*Adhesives, High temperature research, *Heat resistant polymers, Polymers, Phenols, Methyl radicals, *Triazines, Synthesis, Molecular weight, Nitration, Reduction, Polymerization, Adhesion.) (Amines, Benzoyl radicals, Guanidines.) (Adhesives for Stainless steel.)

Chemical modifications were attempted on poly-2,6-xylenols and condensation triazine type polymers which had been found to be suitable base material for high temperature adhesives for stainless steel. Poly-2,6xylenol was prepared. High molecular weight polyxylenols had good adhesion (2000-3000 psi) at room temperature, but lost strength to 10% of the original after heating at 550 F. for 30 min. The low molecular weight material may flow better and therefore impart better wetting. Several low molecular weight polyxylenols were prepared. 2-Methyl-6-allyl-4-bromophenol was prepared and a polymer was prepared from it by the Price method of oxidative couphing. Nitration of 2,4,6-triphenyl-s-triazine yields 2,4-(di-(m-nitrophenyl)-6-phenyl-s-triazine. Reduction of this derivative gives the diamino compound. (Author)

AD-269 883 Div. 14, 16, 25
(TISTM/EJH) OTS price $11.00

Fuels Research Lab., Mass. Inst. of Tech., Cambridge.
TRANSIENT HEAT AND MOISTURE TRANSFER TO SKIN THROUGH THERMALLY IRRADIATED CLOTH,
by H. C. Hottel, G. C. Williams and others.
26 Dec 61, 138p. incl. illus. 23 refs. (Technical rept. no. 8)
(Contract DA 19-129-qm-1592, Proj. nos. 7-12-01-002c and 7-99-01-001)
Unclassified report

DESCRIPTORS: (*Skin, Burns, Inhibition, Simulation.) (Protective coverings, *Protective clothing, Fire protective clothing, Materials, Textiles, Cotton textiles, *Heat transfer, Thermal conductivity, Colors, Moisture, Mathematical analysis.) (Thermal radiation, Thermal insulation, Test methods, Test equipment.)

A study was made of the action of cloth in protecting skin from thermal injury resulting from exposure to high-intensity thermal radiation. Methods were developed to obtain temperature-time-depth data for a system simulating skin covered by a layer of dry or moist cloth. Experimentally this was accomplished by the use of a copper-air simulant which accepts heat at the same rate as human skin but develops a proportionally stretched temperature profile. The method facilitates the inspection of the influences on temperature distribution in the skin of various system properties and the surrounding conditions. The skin enthalpy rise above a critical temperature level, a feasible basis for correlating burn data, was found to be very sensitive to slight variations in the temperature response and deserves further testing. (Author)

AD-269 898 Div. 14, 17
(TISTM/EJH) OTS price $7.60

Naval Weapons Plant, Washington, D. C.
EVALUATION OF AQUEOUS DISPERSIONS OF TFE-FLUOROCARBON RESINS (TEFLON) APPLIED AS THIN FILMS TO METAL SUBSTRATES,
by Joseph H. Thompson and Calvin L. Scott.
1 Aug 61, 66p. incl. illus. tables, 6 refs.
(NAVORD rept. no. 6969)
Unclassified report

DESCRIPTORS: (*Steel, *Aluminum alloys, Coatings, *Plastic coatings, Thin films, *Lubricants, Polymers, Ethylenes, Fluorides, Enamel coatings, Surface properties, Thickness, Corrosion inhibition, Adhesion, Wetting agents, Heat treatment, Temperature, Humidity.) (Resins, Tests, Test methods, Sea water.)

TFE-resin Teflon coating systems were prepared on steel and Al specimens from proprietary TFE-resin primer and enamel coating material. The results show the primers provide good adhesion and equal corrosion protection. Corrosion protection is dependent on the total film thickness; the black and white enamels provide superior cor-

rosion protection; the gray enamel provides inferior protection. The rate of heating to TFE-resin sintering temperatures of two Al alloys with increasing cross sectional thickness was investigated to determine the time required to sinter TFE-resin coatings on various size pieces. (Author)

15. MATHEMATICS

AD-269 006 Div. 15
(TISTP/MFA) OTS price $1.60

Northwestern Technological Inst., Evanston, Ill.
EXTENSIONS OF A THEOREM BY CLARK,
by A. Charnes, W. W. Cooper, and G. L. Thompson.
13 Dec 61, 16p. 4 refs.
(Contract Nonr-122810, Proj. NR 047-021; In cooperation with Carnegie Inst. of Tech., Graduate School of Industrial Administration, Contract Nonr-76001, Proj. NR 047011)
(ONR Research memo. no. 85) Unclassified report

DESCRIPTORS: (*Linear programming, *Matrix algebra, Scheduling, Theory.)

If a linear programming problem (written in inequality form) has a solution, then either the primal constraint set or the dual constraint set is unbounded. The parenthetical remark is our addition to the statement of the theorem, but is implicitly assumed. The inequality form of the general linear programming problem is sometimes referred to as the canonical form and used as a standard point of departure for further analyses. Yet some care may be needed, as is true here, if a full degree of generality and understanding is to be achieved. (Author)

AD-269 071 Div. 15
(TISTP/MFA) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOME PROPERTIES OF GENERALIZED AXIALLY SYMMETRIC POTENTIALS,
by R. P. Gilbert. Nov 61, 19p. 20 refs.
(Technical note no. BN-265)
(Contract AF 49(638)228)
(AFOSR-1854) Unclassified report

DESCRIPTORS: (Operators (Mathematics), Complex variables, Transformations (Mathematics), *Partial differential equations, Potential theory, Polynomials.)

Some properties of the functions of generalized axially symmetric potential theory (GASPT) are investigated by the Sonine-Bergman operator. GASPT function elements are considered in the case of entire and meromorphic associates. Theorems concerning inequalities and location of singularities are obtained. (Author)

AD-269 105 Div. 15, 32
(TISTB/MS) OTS price $2.60

Rand Corp., Santa Monica, Calif.
VALUES OF LARGE GAMES, III: A CORPORATION WITH TWO LARGE STOCKHOLDERS,
by L. S. Shapley. Dec 61, 19p. incl. illus. table, 4 refs. (Research memo. no. RM-2650-PR)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: (*Games theory, Management engineering, Commerce, Control, Economics, Industry.)

This paper contains a numerical and graphical analysis of a class of games having two major players and a continuous infinity of minor players. For expository convenience, the games are interpreted in terms of the control by stockholders of a large corporation. This note provides an illustration of the theory of oceanic games presented in the preceding paper of this series (RM-2649). (Author)

AD-269 117 Div. 15
(TISTP/MFA) OTS price $7.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
EXISTENCE OF SMOOTH SOLUTIONS OF THE CAUCHY PROBLEM FOR DIFFERENTIAL SYSTEMS OF ANY TYPE,
by Avner Friedman. 21 Nov 61, 76p. 14 refs.
(Technical rept. no. 103)
(Contract Nonr-22511, Proj. NR-041-086, In cooperation with Minnesota University)
Unclassified report

DESCRIPTORS: (*Partial differential equations, *Complex variables, Fourier analysis, Green's function, Matrix algebra, Polynomials, Integral Transforms, Taylor's series.)

Smooth solutions for the Cauchy problem are presented where x equals (x1, ... , xn) varies in the real euclidean space Rn, t varies in an interval 0 less than or equal to t less than or equal to T, u is a vector of dimension N and P is a matrix of order N X N whose elements are polynomials in partial derivatives of degree less than or equal to p. (Author)

AD-269 198 Div. 15
(TISTP/MFA) OTS price $12.50

Numerical Analysis Research, U. of Calif., Los Angeles, Calif.
QUADRATIC VARIATIONAL PROBLEMS INVOLVING HIGHER ORDER, ORDINARY DERIVATIVES.
Doctoral thesis,
by Genovevo Cabrera Lopez. Oct 61, 168p.
23 refs.
(Contracts Nonr-23324, and DA 04-495-ORD-1630)
Unclassified report

DESCRIPTORS: (*Calculus of variations, Operators (Mathematics), Functional analysis, Topology, *Differential equations, Integral equations, Transformations (Mathematics), Linear systems.)

A quadratic functional J(x) involving ordinary derivatives of higher order is studied. The self-adjoint, linear operator T associated with J(x) is in general an integro-differential operator. The study of J(x) is of course equivalent to the study of a problem of Bolza, involving only first order derivatives. However, it is desirable to study J(x) directly, without transforming the problem, and to ascertain the nature and form of the consequent results. The results presented depend fundamentally on an extension of the fundamental lemma in the calculus of variations. The extension of that lemma is formulated in terms of the Lebesgue-Stieltjes integral. (Author)

AD-269 318 Div. 15
(TISTP/JW) OTS price $1.10

Washington U., Seattle.
A SYSTEM OF IBM TYPE 709 PROGRAMS FOR OBTAINING PRINCIPAL AXES FACTORS OF LARGE ORDER CORRELATION MATRICES,
by George Burket. Oct 61, 8p. 2 refs.
(Contract Nonr-47708)
Unclassified report

DESCRIPTORS: (*Programming, Computers.) (Matrix algebra, Correlation techniques, *Computer logic.)

In a factor analysis system where the principal axes program operates directly on the correlation matrix, the number of variables which can be factored is limited in practice by the size of symmetric matrix which can be contained in core. With a 32K core, this amounts to a maximum of around 240 variables. The number of observations is not restricted. The system reported here restricts the number of observations, but allows for a relatively large number of variables. Instead of computing a correlation matrix, which is the minor product moment of the normalized data matrix, this system computes the major product moment of the normalized data matrix. The principal axes program operates on the latter matrix, which is of the order of the number of observations, and produces factor scores rather than factor loadings. (Author)

AD-269 319 Div. 15
(TISTP/JW) OTS price $1.10

Washington U., Seattle.
PRINCIPAL AXES FACTOR ANALYSIS PROGRAM FOR THE IBM TYPE 709,
by Donald P. Horst and George R. Burket. Nov 61, 6p. 4 refs.
(Contract Nonr-47708)
Unclassified report

DESCRIPTORS: (*Matrix algebra, Correlation techniques, Computer logic.) (*Computers, Programming, Factor analysis.)

A program is to be developed which will compute eigenvalues, normalized eigenvectors, and principal axes factor loading vectors for symmetric matrices of order as large as 242. Where the number of observations does not exceed 242, the program may be applied to considerably larger matrices in conjunction with a system reported elsewhere (Burket, 1961). The program may also be used to obtain a rapid solution for an arbitrary factor loading matrix which, for a given rank, will account for approximately as much variance as the corresponding principal axes solution, and which will also reduce the rank of the residual by exactly one for each factor extracted. (Author)

AD-269 322 Div. 15, 30
(TISTP/MFA) OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
A CALCULUS FOR FACTORIAL ARRANGEMENTS,
by B. Kurkjian and M. Zelen. Oct 61, 35p. 11 refs. (MRC Technical summary rept. no. 265)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Factor analysis, *Calculus of variations, Matrix algebra, Combinatorial analysis, Polynomials, Groups (Mathematics), Number theory, Probability.) (Digital computers, Design, Programming.)

A special calculus for the analysis of factorial experiments is introduced. The calculus applies to the general case of asymmetric factorial experiments and is not restricted to symmetric factorials as is the current theory which relies on the theory of finite projective geometry. The concise notation and operations of this calculus point up the relationship of treatment combinations to interactions and the effect of patterns of arrangements on the distribution of relevant quantities. One aim is to carry out complex manipulations and operations with relative ease. The calculus enables many large order arithmetic operations, necessary for analyzing factorial designs, to be partly carried out by logical operations. This should be of importance in programming the analysis of factorial designs on high speed computers. (Author)

AD-269 323 Div. 15
(TISTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
BOUNDS FOR SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS,
by Fred Brauer. Nov 61, 12p. 11 refs. (MRC Technical summary rept. no. 272)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Differential equations, *Algebraic topology, Functions, Integration, Integrals.)

Most of the known explicit bounds, as well as criteria for global existence and boundedness, can be obtained from comparison theorems, together with a detailed analysis of the resulting first order differential equations. The same approach also yields information on the approach of a solution to a limit. The bounds given are sometimes difficult or impossible to calculate explicitly, but it is possible to give slightly weaker bounds, which are more easily calculated. The main conclusion to be drawn is that the comparison method provides not only a powerful tool for obtaining bounds for solutions, but also a unified approach to many such problems. (Author)

AD-269 324 Div. 15
(TISTP/TL) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
REMARKS ON GENERAL TAUBERIAN THEOREMS,
by Nicolas Artemiadis. Oct 61, 17p. 5 refs.
(MRC Technical summary rept. no. 266)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Series, Integral transforms, Taylor's series, Inequalities.)

Identifiers: Tauberian theorem.

Let $K(x)$ be a function of the class $L_1(\int_{-\infty}^{\infty} |K(x)| dx < \infty)$, and $h(x)$ a bounded function on the real line. Consider the function $H(x) = \int_{-\infty}^{\infty} K(x-y)h(y)dy$. In the theory of general tauberian theorems, the behaviour of $H(x)$, when x tends to infinity, is considered. Wiener using the theory of Fourier transforms, proved that in

certain cases the existence of the limit $\lim_{x \to \infty} H(x)$ for a particular function $K \in L_1$, implies the existence of the same limit for all functions of the class L_1. The main Wiener's tauberian theorem is presented. (Author)

AD-269 325 Div. 15
(TISTP/TL) OTS price $4.60

Mathematics Research Center, U. of Wisconsin, Madison.
TESTING EQUALITY OF MEANS AFTER A PRELIMINARY TEST OF EQUALITY OF VARIANCES,
by J. Gurland and R. S. McCullough. Oct 61,,, 41p. tables, 15 refs. (MRC Technical summary rept. no. 267)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Statistical distribution, Statistical test, *Statistical analysis, *Statistical functions, *Probability.) (Inequalities, Integration, Integrals, Transformations (Mathematics), Series.)

In testing equality of means of two Normal populations, Student's t-test is not generally applicable when the variances of the two populations may be unequal and their ratio unknown. A procedure is considered whereby a preliminary test is performed to ascertain whether or not the variances may be regarded as equal. On the basis of the outcome of this preliminary test, one proceeds to test for equality of means. Tables of size and power are included to indicate the behavior of the proposed tests. (Author)

AD-269 327 Div. 15
(TISTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
NOTES ON A VARIETY OF PROBLEMS OF DIFFERENTIAL SYSTEMS,
by V. Lakshmikantham. Oct 61, 15p. 11 refs. (MRC Technical summary rept. no. 270)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Differential equations, Functions, Transformations (Mathematics), Harmonic analysis, Algebraic topology.)

A variety of problems of differential systems are considered. The results cover global existence, boundedness and stability with respect to origin, a set and another system, uniqueness and the existence of periodic solutions. (Author)

AD-269 526 Div. 15
(TISTP/MFA) OTS price $1.60

Personnel Lab., Aeronautical Systems Div., Lackland Air Force Base, Tex.
GRAPHIC DETERMINATION OF COEFFICIENTS OF PART AND MULTIPLE CORRELATION IN THREE-VARIABLE PROBLEMS,
by Fred E. Holdrege and Gerald Born. Oct 61, 13p.
(Proj. 7719)
(ASD TN-61-144) Unclassified report

DESCRIPTORS: (Algebra, *Projective geometry, *Numerical analysis.)

On many occasions it is convenient to solve equations graphically rather than algebraically. A convenient means for graphically determining the values of coefficients of part correlation, coefficients of multiple correlation, and beta weights for three-variable problems is presented. (Author)

AD-269 604 Div. 15
(TISTP/MFA) OTS price $1.60

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
REMARKS ON THE CONTINUED FRACTION CALCULATION OF EIGENVALUES AND EIGENVECTORS,
by Jerome D. Swalen and Louis Pierce. 1960, 13p. 12 refs. (Rept. no. P-883)
(Contract N5ori-186614; In cooperation with Notre Dame U.)
Unclassified report

DESCRIPTORS: (*Continued fractions, Metamathematics, *Integral equations, *Matrix algebra, Transformations (Mathematics), Electronic equipment, Digital computers.)

For eigenvalue problems in which the secular determinant has tridiagonal form, e.g., the rigid asymmetric rotor; the secular equation may be written in the form f(1') equals 0, where f(1') is a continued fraction and (1') an eigenvalue. Furthermore, if the secular problem is of nth order, then the continued fraction (1') may be developed in n different ways. Since the eigenvalues are roots of a function f(1'), it is convenient to find the eigenvalues by means of the Newton-Raphson iterative procedure. This requires that the derivative of f(1') with respect to 1(f'(1) be determined. An exact expression for f'(1) is derived and it is shown that f'(1') is in fact the norm of the eigenvector belonging to the eigenvalue 1'. A simple recursion formula, in continued fraction form, for the eigenvector elements is also derived. (Author)

AD-269 682 Div. 15
(TISTP/MFA) OTS price $1.60

Princeton U., N. J.
ON UTILITY. I. THE VALIDITY OF THE EXPECTED

UTILITY HYPOTHESIS. II. ON BERNOULLIAN UTILITY FOR GOODS AND MONEY,
by S. N. Afriat. 1 Dec 61, 24p. incl. illus. 20 refs. (Research memo. no. 35)
(Contract Nonr-185816)
Unclassified report

DESCRIPTORS: (Statistical analysis, *Statistical distribution, Probability, *Games theory.) (Economics, Costs, *Money.)

A model of behavior in circumstances of uncertainty is now represented by a preference order between certain distributions which determines a best distribution among any that are attainable on any occasion, and hence an act which is possible and which has that distribution as outcome. But since certainty appears as a special instance of uncertainty, the preference order between objects X which gives a model for behavior with certainty, induces a corresponding order between special distributions which must be contained in this preference order between other distributions. The expected utility hypothesis for uncertain choice is the hypothesis that every object Xr has a certain utility U(Xr) determining the expected utility for an act which gives outcome X with a probability distribution and that preference between distributions corresponds to relative magnitude of expected utility, so choice is determined by the maximum of possible expected utility. (Author)

AD-269 726 Div. 15, 12
(TISTP/MFA) OTS price $1.60

Westinghouse Electric Corp., Baltimore, Md.
A SERIES EXPANSION OF THE TRUE ANOMALY,
by E. W. Paul. 9 Nov 61, 12p.
(Contract AF 49(638)1002, Proj. 9783)
(AFOSR-1797) Unclassified report

DESCRIPTORS: (*Series, Fourier analysis, *Celestial mechanics, Bessel functions, Satellite vehicles, Orbital flight paths, Functions, Theory.)

A series expansion of the true anomaly as a Fourier series in the mean anomaly is derived. The coefficients are in a form different from Bessel's representation. However, it appears that for practical application there is no special advantage to either form. (Author)

AD-269 813 Div. 15, 30
(TISTP/TL) OTS price $1.60

Hebrew U. (Israel).
ON SEQUENTIAL LANGUAGES,
by E. Shamir. Nov 61, 18p. 7 refs. (Technical rept. no. 7)
(Contract N62558-2214)
Unclassified report

DESCRIPTORS: (*Sequential analysis, Statistical analysis, Probability, Mathematical logic.) (*Language, Programming, Coding, Automation, Theory.)

AD-269 839 Div. 15, 30
(TISTP/TL) OTS price $1.60

California U., Los Angeles.
ON A SUCCESSIVE APPROXIMATION TECHNIQUE IN SOLVING SOME CONTROL SYSTEM OPTIMIZATION PROBLEMS,
by Masanao Aoki. Dec 61, 8p. 10 refs. (Rept. no. 61-82)
(Contract Nonr-23352)
Unclassified report

DESCRIPTORS: (*Control systems, *Programming.) (Functional analysis, Algebra, Sequences, Nonlinear systems, Nonlinear differential equations, Partial differential equations, Differential equations, Equations, Functions.)

A way of constructing minimizing sequences for functionals in optimization problems has been given and the procedure is proved to converge. The procedure is shown to be that of the Newton's Method in Banach Spaces. (Author)

16. MEDICAL SCIENCES

AD-269 052 Div. 16
(TISTB/LH) OTS price $1.60

Winifred Masterson Burke Relief Foundation, White Plains, N. Y.
PROTEIN AND AMINO ACID NUTRITION OF MAN IN HEALTH AND DISEASE.
Annual progress rept., 1 Jan-31 Dec 61,
by Anthony A. Albanese. 1 Dec 61, 11p. 11 refs.
(Contract Nonr-314500, Proj. NR 108-975)
Unclassified report

DESCRIPTORS: (*Nutrition, *Proteins, *Amino acids, Hormones, Cholesterol.)

AD-269 191 Div. 16
(TISTB/CCH) OTS price $3.60

Baltimore City Hospitals, Md.
THE PHYSIOLOGY OF MECHANICAL TRAUMA.
Rept. for 1 Jan-31 Dec 61,
by Benjamin F. Rush, Jr. 31 Dec 61, 22p. incl. illus. tables, 29 refs.
(Contract DA 49-193-md-2016)
Unclassified report

DESCRIPTORS: (*Surgical trauma, *Kidneys, Pathology, Traumatic shock.) (Heart arrest, *Plasma volume, Respiration.) (*Wounds, Bacteria, Clostridium histolyticum.) (*Orthopedics, Stainless steel, Surgery, Arthroplasty.)

Division 16 - MEDICAL SCIENCES

Contents:
The effect of operative trauma upon renal function
Factors leading to renal tubular necrosis in hemorrhagic shock
The effects of hyperosmolarity on renal function in hemorrhagic shock
Observations of various combinations of external cardiac massage and pulmonary ventilation for cardiac resuscitation
Bacterial studies in wounded patients
Motion pictures on the proper handling of patients in the accident room
Relative strengths of certain hip nails.

AD-269 201 Div. 16, 3
(TISTB/LH) OTS price $3.60

Biological Labs., Frederick, Md.
BIBLIOGRAPHY ON VACCINIA, VIRIOLA, AND ANIMAL POX SUPPLEMENT, 1956-1960.
Sep 61, 32p. (Suppl. to AD-116 865)
Unclassified report

DESCRIPTORS: (*Bibliography, *Smallpox, Pathology, Immunization, *Virus vaccines.)

AD-269 231 Div. 16
(TISTB/CCH) OTS price $1.10

Harvard U., Cambridge, Mass.
NUTRITION AND CIRRHOSIS OF THE LIVER.
Rept. for 15 Nov 60-31 Dec 61,
by G. Kenneth Mallory and Richard A. MacDonald.
31 Dec 61, 2p.
(Contract DA 49-007-md-863)
Unclassified report

DESCRIPTORS: (*Liver, Pathology, *Nutrition, *Diseases, Regeneration, Surgery.) Radioactive isotopes, Autoradiography, *Medical research.

Regeneration of the liver and iron diseases of the liver were studied, principally using radioisotope and autoradiographic techniques. (1) A search was made for a possible humoral factor in the blood of rats that controls regeneration of the liver after partial hepatectomy. (2) Obstruction of the common bile duct of the rat was found to result in regeneration of liver cells comparable in number to that seen approximately 48 hours after partial hepatectomy in addition to well known changes in bile ducts. (3) In experimental carcinoma of the liver produced by feeding a butter yellow derivative, an increased regeneration of lever cells did not precede the occurrence of tumors. (4) Regeneration of the cirrhotic liver produced by dietary means was compared with regeneration of normal rat liver, in both cases following partial hepatectomy. Cirrhotic liver responded at the same times and to the same extent as normal liver. (Author)

AD-269 286 Div. 16
(TISTB/MS) OTS price $1.10

RIAS, Inc., Baltimore, Md.
RESEARCH IN BIOPHYSICAL ASPECTS OF PHOTOSYNTHESIS.
Final rept., Oct 59-Sep 61,
by Hans J. Trurnit, Federico Vilallonga and others. Sep 61, 8p. 8 refs.
(Contract Nonr-302500, Proj. NR 108-462; In cooperation with Buenos Aires U. (Argentina))
Unclassified report

DESCRIPTORS: (*Photosynthesis, Biophysics, Biochemistry, Fatty acids, Albumins, Theory.) (Plants, Growth.) Electron microscopy.

AD-269 298 Div. 16
(TISTB/CCH) OTS price $2.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
ACCELERATION OF BONE REPAIR BY CHONDROITIN SULFATE TREATMENT OF IMPLANTS,
by Martin Burger, Burton S. Sherman, and Albert E. Sobel. July 61, 23p. incl. illus. tables, 24 refs. (Rept. no. 61-63)
(In cooperation with The Jewish Hospital of Brooklyn, New York)
Unclassified report

DESCRIPTORS: (*Bone, *Transplantation, Chondroitin sulfate, Therapy.) (Histological sections, *Calcification, Tissues (Biology), Regeneration.) Scientific research, *Medical research.

A histologic and roentgenographic study was made of the repair of bony defects in the calvaria of albino rats. An accelerated rate of bone repair was observed in wounds into which chondroitin sulfate-treated demineralized bone was implanted, as evidenced by maximum repair of the defect in 6 weeks, while 9 weeks were required for maximum healing when untreated demineralized bone was used. In addition, acid-soluble collagen precipitated with chondroitin sulfate was more effective in the healing of the bony defect than was acid-soluble collagen precipitated with NaCl. In no case, however, were any of the materials used as effective as demineralized bone treated with chondroitin sulfate in causing the rapid repair of the bone. The possibility exists that chondroitin sulfate, or a complex of chondroitin sulfate with a protein, has, in these instances, acted as an 'induction' factor for the formation of the new bone necessary to repair the bony defect. (Author)

AD-269 364 Div. 16
(TISTB/AW) OTS price $8.10

Marine Lab., U. of Miami, Coral Gables, Fla.
PHYSIOLOGY AND ECOLOGY OF THE MARINE FUNGI.
Annual rept.,
by Peter L. Sguros, Samuel P. Meyers, and Ernest S. Reynolds. 1 Dec 61, 80p. incl. illus. tables, 62 refs. (Rept. no. ML 62011)
(Contract Nonr-84018, Proj. NR-103-305)
Unclassified report

DESCRIPTORS: (*Fungi, Marine biology, Sea water, Physiology, Nutrition, Ecology, Yeasts, Growth.)

Eleven species representing 10 genera of lignicolous, marine-isolated fungi were studied; six are deuteromycetes and five are ascomycetes. Three cultures, Halosphaeropsis metiosetigera, Culcitalna achraspora, and Humicola alopallonella, were studied in more detail. A quantitative method was tested for the standardized production of reproducible inocula and for the growth measurement of cultures in liquid media. The effect of age and conditioning of inocula on

growth and carry-over is described for two organisms. Under the conditions employed, the capacity of marine fungi to carry over sufficient nutrient factors for growth in fresh deficient media appears greatest in the more vigorous young cultures but relatively low in comparison with terrestrial types. Exhaustion has no apparent harmful effect on growth capacity. The effects of quantity of inoculum on the total crop were noted for three organisms and critical quantities established above which additional inoculum is superfluous and below which the total crop is directly related to the amount of inoculum provided. Increased tendency to pellet formation and loss of chromogenesis were also the result of inadequate quantities of inoculum. Growth curves were established by gravimetry for nine species in natural sea water media. (Author)

AD-269 380 Div. 16
(TISTB/LH) OTS price $2.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THE EFFECTS OF ACCELERATION ON VISUAL BRIGHTNESS DISCRIMINATION.
Final rept.,
by Myron L. Braunstein and William J. White.
Dec 61, 23p. incl. illus. tables, 4 refs. (Rept. no. OM-1570-G-1)
(Contract Nonr-345700)
Unclassified report

DESCRIPTORS: (*Acceleration, Respiration, Pressure breathing, Light, Illumination, *Brightness, *Visual thresholds, Analysis of variance.)

Brightness discrimination thresholds were determined at five levels of transverse acceleration and four levels of positive acceleration. Four background luminance levels, ranging from 31 to .03 foot lamberts, were studied. Contrast required to detect an increment in illumination increased with acceleration. This increase was present for both directions of acceleration and for all background levels, but was most marked for positive acceleration, and for the dimmest background. A preliminary study was conducted on the effects of breathing 100% oxygen and 100% oxygen under pressure, on brightness discrimination under acceleration. (Author)

AD-269 487 Div. 16
(TISTB/LH) OTS price $4.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
CONTROL PERFORMANCE UNDER ACCELERATION WITH SIDE-ARM ATTITUDE CONTROLLERS,
by Randall M. Chambers. 27 Nov 61, 43p. incl. illus. 22 refs. (Rept. no. NADC-MA-6110)
(Task MR005.13-0005.6; rept. no. 11)
Unclassified report

DESCRIPTORS: (*Acceleration tolerance, Centrifuges, Laboratory equipment, Pilots, Stress (Physiology), Stress (Psychology), Control, Effectiveness, Simulation.)

This paper presents procedures, data, and conclusions based on closed-loop centrifuge experiments in which side-arm controllers were used by pilots to perform specific control tasks. Under certain conditions the pilots could perform as well in adverse acceleration fields as they could statically, even though they were exerting more physical effort and psychological concentration, and were enduring visual impairment, chest pains, breathing difficulties, and other stressful effects of acceleration. The pilots demonstrated a remarkable ability to adapt to physiologically severe acceleration environments, and they maintained control performance within acceleration time history profiles which contained vectors with amplitudes as high as +15 G (chest to back), -7 G (back to chest), and +7 G (head to foot). Some closed-loop human centrifuge simulations were conducted which provided human factors data which may have application to the design and evaluation of side-arm controllers for use within proposed space vehicles. (Author)

AD-269 488 Div. 16
(TISTB/MS) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Development Center, Johnsville, Pa.
INCREASE IN ACCELERATION TOLERANCE OF THE RAT BY 2-DIMETHYLAMINOETHYL P-CHLOROPHENOXYACETATE (LUCIDRIL),
by B. David Polis. 27 Nov 61, 8p. incl. illus. 10 refs. (Rept. no. NADC-MA-6136)
(Task MR005.13-0002.7; rept. no. 16)
Unclassified report

DESCRIPTORS: (*Drugs, *Chemotherapeutic agents, *Acceleration tolerance, Stress (Physiology), Survival.) (Acetates, Phenoxy radicals.) *Pharmacology.

The dimethylaminoethyl ester of parachlorophenoxyacetic acid enhanced significantly the tolerance of rats to acceleration at 20 G. The median survival time of treated animals increased to 33.3 min, almost a threefold increment. The effectiveness persisted only for a period of 4 hr after injection. A latent period of 3 to 4 days treatment seemed necessary before the enhanced tolerance to acceleration became apparent. The activity of the drug was dose-dependent in that no significant changes in acceleration tolerance were found with a total injection of 50 mg; significant increments in tolerance were obtained with 75 mg of the drug; much larger increases in the tolerance to acceleration followed administration of 100 mg of Lucidril. The nature of the pharmacologic effect suggests that the drug action per se is mediated via the hypothalamic area of the brain, possibly in interplay with the biogenic amines. The low toxicity of the drug and the fact that it has already been used in humans in high doses with no deleterious and some presumptive beneficial effects leads to the proposal that the compound might be effective in increasing human tolerance to acceleration stress. (Author)

AD-269 651 Div. 16, 12
(TISTA/SEB) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
BEFORE A MANNED FLIGHT,
by L. Gil'bert. 17 Aug 61, 13p. incl. illus.
(Trans. no. MCL-1280/1 of Znaniye - Sila 10:6-8, 1960)
Unclassified report

DESCRIPTORS: (Space flights, Spaceships, Manned, Physiology, Gravity, *Acceleration, *Deceleration, Weightlessness, Simulation, Rocket propelled sleds, Centrifuges.) USSR.

The effect of g-forces (acceleration and deceleration) and of weightlessness are discussed; test equipment are also mentioned.

AD-269 688 Div. 16
(TISTB/CCH) OTS price $1.10

New York Zoological Society, Brooklyn, N. Y.
BIOLOGICALLY ACTIVE STEROID GLYCOSIDES FROM HOLOTHURINS.
Final rept.,
by Ross F. Nigrelli. 1961, 8p.
(Contract Nonr-226600, Proj. NR 107-354)
Unclassifiedreport

DESCRIPTORS: (*Echinoderms, *Steroids, *Glycosides, Toxicity, *Fishes, Sharks, Chemotherapeutic agents, Nerves, Inhibition.) (*Marine biology, Biochemical tests, Biology, Ecology, Chemical properties.)

Published reports show that the crude holothurin derived from the Cuvierian tubules of the Bahamian sea-cucumber Actinopyga agassizi has a wide variety of biological properties, including an irreversible blocking action on nerve, interference in the sequential developmental processes of the sea-urchin egg, and inhibition of certain tumors in mice. The published paper appended to this report summarizes the effects of holothurin on various biological systems and also includes a bibliography of the several papers published on this subject. (Author)

AD-269 692 Div. 16
(TISTB/CCH) OTS price $1.10

Pennsylvania U., Philadelphia.
EXPLORATION OF THE BIOCHEMICAL BASIS FOR DIFFERENT ELECTROPHYSIOLOGICAL STATES OF THE NERVOUS SYSTEM.
Final rept., 9 Mar 59-15 Mar 61,
by Britton Chance. 29 Dec 61, 3p. 5 refs.
(Contract DA 18-108-405-cml-339)
Unclassified report

DESCRIPTORS: (*Brain, *Biochemical tests, *Electrical properties, Cells (Biology).) (*Nervous system, Tissues (Biology), *Metabolism, Enzymes, Oxidation, Metabolic products, Adenosine phosphates, Brain tumor, Nucleotides.) Instrumentation, *Medical research.

AD-269 764 Div. 16
(TISTB/CCH) OTS price $1.10

Harvard U. Medical School, Boston, Mass.
INFLUENCE OF ENVIRONMENTAL ALTERATIONS ON THE PERIPHERAL TRANSPORT AND METABOLISM OF THYROID HORMONE.
Final technical rept., 1 July 53-30 June 61,
by William B. Castle and Sidney H. Ingbar.
30 June 61, 7p. 60 refs.
(Contract DA 49-007-md-412)
Unclassified report

DESCRIPTORS: (*Thyroid hormones, *Biosynthesis, *Metabolism, *Thyroxine, Detection, Purification, Blood circulation, Blood proteins, Deterioration.) Iodine.

Studies performed during the completed tenure of this contract have been principally directed toward the following objectives: Identification, purification and characterization of the thyroxine-binding proteins of the plasma and elucidation of their physiological role and aberrations in disease states; investigation of the intracellular mechanism for the degradation of the thyroid hormones and of the relationship between hormonal degradation and action; investigation of the mechanism of thyroid hormone biosynthesis and its regulation by intermediary metabolism of the thyroid. Specific findings in these studies have been described. (Author)

AD-269 786 Div. 16
(TISTB/LH) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
PROTEIN-PRODUCING MICROORGANISM.
6 Dec 61, 2p. 2 refs. (AID rept. 61-162 of Microorganism Creates Protein; Pravda Ukrainy 3, 22 Nov 61)
Unclassified report

DESCRIPTORS: (*Proteins, Production, *Microorganisms, Algae, Feeding, Growth, Nutrition.)

A protein-producing microorganism was recently discovered in the intestines of pigs by Ivan Orobinskiy at the Krasnoyarsk Agricultural Institute. The microorganism utilizes nitrogen from the air to produce protein. It also produces small amounts of lactic acid, vitamins, growth hormones, and antibiotics. The chief value of Orobinskiy's microorganism lies in its ability to increase the protein content of potatoes from 1 to 8%, of grain husks from 1.5 to 9.5%, of ground-up straw up to 4%, and of silage up to 2%. Feeding piglets a provender-bacterin, prepared by inoculation of potato mash by a pure culture of the microorganism, increased their weight 70 to 90% over that of control animals. Mass production of Orobinskiy's provender-bacterin is being arranged in Siberia. (Author)

AD-269 825 Div. 16
(TISTB/CCH) OTS price $4.60

Armour Research Foundation, Chicago, Ill.
BIOCHEMISTRY OF TOXIC PROTEINS. FRACTIONATION OF INDIAN COBRA VENOM BY COLUMN CHROMATOGRAPHY.
Final rept., 15 Sep 60-31 Oct 61,
by W. H. Riesen and E. J. Hawrylewicz.
16 Jan 62, 42p. incl. illus. tables, 16 refs.
(Contract DA 18-108-405-cml-928)
Unclassified report

DESCRIPTORS: (*Proteins, *Toxicity, *Biochemistry, *Snake venom, Biochemical tests, Electrophoresis.) (*Fractionation, Chromatographic analysis, Dextran, Carboxymethylcellulose, Experimental data.) Drugs, Survival, Stability.

Indian cobra venom was fractionated chromatographically with dextran gels and carboxymethylcellulose (CMC). Five fractions, including two with toxicity, were obtained from dextran gel of optimal cross-linkage. Resolution and yield were affected by the ratio of sample to absorbent. Twelve fractions from CMC included two with toxicity that were heat labile and stable, respectively. Most fractions by both methods of chromatography were heterogeneous by zone electrophoresis. Three bioassay methods showed different degrees of enrichment of toxicity. (Author)

17. METALLURGY

AD-269 018 Div. 17
(TISTM/TCG) OTS price $5.60

Illinois U., Urbana.
INVESTIGATION OF INTERACTION OF INTERSTITIAL IMPURITIES WITH DEFECTS IN BCC METALS.
Final rept.,
by Donald Keefer and Charles Wert. 15 Oct 61, 35p. illus. 19 refs.
(Contract DA 11-022-ORD-2705, Proj. TB2-0001)
(AROD rept. no. 2085.4 and AROD rept. no. 2085.3)
Unclassified report

DESCRIPTORS: (*Metals, *Iron, *Wire, Lattices, Impurities, Effectiveness of Nitrogen and Carbon, Atoms, Diffusion, Chemical bonds, Theory.) (Relaxation time, Friction, Elasticity, Stresses, Energy, Thermodynamics, Measurement, Test methods.) (Solids, Solutions, Heat treatment, Deformation.)

Research was conducted on the interaction of interstitial impurities with dislocations. An extensive investigation of the cold-work internal friction peak due to N and C in deformed alpha-Fe was made. Self-association of interstitials in Fe was also studied. This investigation was concerned with the departure from randomness of solid solutions of N and C in Fe. (Author)

AD-269 130 Div. 17, 26
(TISTM/REB) OTS price $11.00

Westinghouse Electric Corp., Pittsburgh, Pa.
DEVELOPMENT OF NIOBIUM-BASE ALLOYS.
Rept. for 1 June 59-31 July 60 on Metallic Materials,
by Richard T. Begley, William N. Platte and others. Sep 61, 134p. incl. illus. tables, 32 refs.
(Contract AF 33(616)6258, Proj. 7351)
(WADC TR 57-344, pt. 5)
Unclassified report

DESCRIPTORS: (*Niobium alloys, *Niobium, Mechanical properties.) (Niobium, Additives, Oxygen, Nitrogen, Carbon.) (Niobium alloys, Preparation, Processing, Extrusion, Melting, Welding.) Refractory materials.

The effect of O and N additions on the hardness, workability, strain-hardening characteristics, and recrystallization behavior of Nb was determined. N additions were detrimental to cold rolling characteristics. Hardness, workability, and mechanical property data for Nb-C alloys were obtained. Grain boundary carbides were detrimental to cold workability. Carbon additions increased the ductile-brittle transition temperature range of Nb. Mechanical property data were obtained for many binary, ternary and quaternary Nb base alloys. Re, W, and Mo additions increased the ductile brittle transition of Nb. A number of alloys were prepared by the consumable electrode arc melting process. Ingot breakdown was accomplished by high energy rate extrusion (Dynapak). The results of Dynapak extrusion were very encouraging. Several high strength alloys were investigated. One alloy, Nb-10W-5V-1Zr, had excellent room temperature ductility and ultimate tensile strengths of 64,800 psi and 29, 450 psi at 1205 and 1315 C respectively. (Author)

AD-269 137 Div. 17, 4
(TISTM/EJH) OTS price $.50

Watertown Arsenal Labs., Mass.
ION EXCHANGE-PHOTOMETRIC DETERMINATION OF TANTALUM IN VANADIUM ALLOYS.
Report on Research of Materials for Lightweight Construction,
by Thomas A. Ferraro, Jr. Dec 61, 16p. incl. tables, 31 refs. (Technical rept. no. WAL TR 823/2)
(DA proj. 593-32-003) Unclassified report

DESCRIPTORS: (*Vanadium alloys, *Tantalum, Chemical analysis, Ion exchange, Solvent extraction, Separation, Photometers.) (Reagents, Nitric acid, Hydrogen compounds, Fluorides, Hydroxides, Benzenes.)

A method was developed for the determination of tantalum in vanadium alloys. Tantalum is determined photometrically with pyrogallic acid following a separation by ion exchange. A detailed procedure is given. (Author)

AD-269 160 Div. 17, 27, 1, 20
(TISTM/GEC) OTS price $7.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INVESTIGATIONS OF HEAT RESISTANT ALLOYS (SELECTED ARTICLES),(Issledovaniya Zharoprochnykh Splavov (Trudy 123)).
4 Dec 61, 69p. 11 refs. (Trans. no. FTD-TT-61-31 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Oborongiz, Moskva, pp. 17-34, 45-52, and 65-68, 1960)
Unclassified report

DESCRIPTORS: (*Heat resistant alloys, *Corrosion-resistant alloys, High temperature research, Stainless steel, Austentite, Steel, Titanium alloys, Aluminum alloys, Tungsten alloys, Silicon alloys, Chromium alloys, Boron alloys.) (Tests, Crystal structure, Grains (Metallurgy), Mechanical properties, Physical properties, Surface properties.) (Aircraft, Hypersonics, Supersonic planes, Gas turbine blades for Jet engines, Nuclear power plants.) USSR.

Contents:
Selective alloying as a method for improving heat resistance, by S. M. Vinarov
Investigation of the dependence of the structure and properties of gas turbine blades on the duration of operations, by S. T. Kishkin, A. A. Klypin, N. V. Karyakina
Strength of alloys in contact with Na, by S. T. Kishkin, and G. P. Benediktova
High temperature corrosion resistance, by G. N. Dubinin

AD-269 162 Div. 17
(TISTM/EJH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
NATURE OF SECONDARY MARTENSITE CONVERSION IN STEEL (K Voprosu O Prirode Vtorichnogo Martensitnogo Prevrashcheniya V Stalyakh),
by G. V. Korotushenko. 4 Dec 61, 14p. incl. table (Trans. no. MCL-1386/1 of Izvestiya Vysshikh Uchebnykh Zavedeniy - Chernaya Metallurgiya, Issue no. 12:114-123, 1960)
Unclassified report

Division 17 - METALLURGY

DESCRIPTORS: (*Steel, *Austenite, *Martensite, Processing, Heat treatment, Hardening, Phase studies, Phase transitions, Stresses, Microstructure, Lattices.) USSR.

In the process of annealing steel with structure of non-cold-hardened austenite, secondary martensite conversion, not accompanied by depletion of mean composition of austenite, is observed. This martensite conversion is due to the rise of stresses of II magnitude in the austenite which are due to ferritocarbide formations in the austenitic matrix. Secondary martensite conversion during the annealing of a cold-hardened austenite, within a period of lasting exposures, is due to the influence of two factors: increase of micro-stresses of II magnitude and depletion of mean composition of remanent austenite, with the first factor playing the predominant role. The cause for the origination of micro-stresses is analogous to the cause indicated above. (Author)

AD-269 190 Div. 17, 14
(TISTM/LH) OTS price $7.60

Defense Metals Information Center, Columbus, Ohio.
DEFENSE METALS INFORMATION CENTER SELECTED ACCESSIONS. DECEMBER 1961.
comp. by Virginia L. Frazier. Dec 61, 58p.
Unclassified report

DESCRIPTORS: (*Bibliography, *Materials, *Metals, Alloys, Ceramic materials, Refractory materials, Rare earth elements, Processing, Mechanical properties, Physical properties.)

AD-269 199 Div. 17
(TISTM/EJH) OTS price $.75

Institute of Engineering Research, U. of Calif., Berkeley.
EFFECT OF STRESS ON THE CREEP RATE OF HIGH PURITY ALUMINUM IN THE CROSS-SLIP REGION.
Rept. for 31 Mar 59-31 Mar 60, on Solid State Research and Properties of Matter,
by N. Jaffe, and J. E. Dorn. Sep 61, 20p. incl. illus. tables, 9 refs.
(Contract AF 33(616)7213, Proj. 7021)
(WADD TR 61-200) Unclassified report

DESCRIPTORS: (*Aluminum, Crystals, Crystal structure, Lattices, Temperature, Stresses, Deformation, *Creep, Theory, Energy.)

The effect of stress on the creep rate of high purity polycrystalline Al in the intermediate temperature range was investigated by conducting creep tests at a series of different stresses and by decreasing the stress abruptly during the course of primary and secondary creep. Three series of decreases in stress tests were conducted: the stress was decreased in primary and secondary regions of creep at 347.5 K and the stress was decreased in primary creep at 327 K. The results demonstrate the effects of structure and temperature on the stress dependence of the creep rate. The trends in the creep rate after drop in stress are complicated and show that recovery takes place. The experimental results were compared with Friedel's theory for cross-slip, the experimentally determined energy for a constriction being in good agreement with the theoretical estimate proposed by Stroh. (Author)

AD-269 209 Div. 17, 26
(TISTM/GEC) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
A REVIEW OF RECENT DEVELOPMENTS IN TITANIUM AND TITANIUM ALLOY TECHNOLOGY.
Rept.for Sep-Dec 61.
by R. A. Wood. 29 Dec 61, 4p. incl. 11 refs.
(DMIC memo. no. 144)
Unclassified report

DESCRIPTORS: (*Titanium alloys, *Sheets, Contamination, Air, Gases, Corrosion inhibition, High temperature research.) (Chemical milling, Oxidation, Oxidation inhibitors, Coatings.) Ignition, Manufacturing methods, Mechanical properties, Impurities, Processing, Extrusion, Metallurgy.

A study of the air contamination and protection for 4 DOD Ti sheet alloys indicated that Ti-4Al-3Mo-1V and Ti-6Al-4V had about equal resistance to penetration by interstitial contaminants. The hardness penetration tests showed Ti-13V-11Cr-3Al and Ti-2.5Al-16V alloys had lower resistance to contamination in that order. The Ti-5Al-2.5Sn, Ti-6Al-4V, and Ti-13V-11Cr-3Al alloys were evaluated for susceptibility to H embrittlement induced by chemically milling in a hydrofluoric acid bath. The all-alpha Ti-5Al-2.5Sn alloy was not embrittled. The Ti-6Al-4V alloy was only slightly embrittled, while the Ti-13V-11Cr-3Al alloy was severely embrittled. An investigation concerning the titanium-LOX reaction was conducted by using high-pressure gaseous O. The study established that a fresh Ti surface would react with gaseous O under about 100-psig pressure between -250 F and room temperature. Several methods of producing flat solution-treated titanium alloy sheet are reviewed and a new concept is described. Basically, the new method involves heating and cooling the sheet under tension. (Author)

AD-269 237 Div. 17
(TISTM/GEC) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
STRAIN AGING IN MOLYBDENUM.
Master's thesis,
by Robert J. Wilson. Aug 61, 48p. incl. illus. tables, 14 refs. (Rept. no. GAW/Mech 61-9)
Unclassified report

DESCRIPTORS: (*Molybdenum, Crystals, Crystal structure, Aging in Liquid metals, Deformation, Measurement, Tensile properties, Elasticity, Test methods.)

A study of the characteristics of strain aging in commercial-purity Mo by the methods of dynamic modulus recovery and yield point return, and a determination of the activation energy of strain aging was made. Modulus specimens, from arc-cast, recrystallized Mo, in the shape of rectangular bars were deformed 3% in compression. The return of Young's modulus was investigated as a function of aging time and temperature. Measurements of resonant frequency were made at room temperature. The rate of increase of the square of resonant frequency, rather than modulus recovery was used to plot the data for determining an activation energy. Tensile specimens from powder-metallurgy Mo sheet were given 2% plastic deformation by straining to the end of the lower yield stress. The rate of

return of yield point with aging time and temperature was plotted. The rate of Young's modulus recovery gave values of activation energy from 24,000 to 28,000 cal/mol. The rate of yield point return gave a single value of 24,000 cal/mol. (Author)

AD-269 261 Div. 17, 26
(TISTM/EJH) OTS price $2.60

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
INVESTIGATION OF SPOT WELDING CHARACTERISTICS OF TITANIUM ALLOYS,
by Edward F. Deesing. 28 Nov 61, 23p. incl. illus. tables (Rept. no. NAMC-AML-1319)
Unclassified report

DESCRIPTORS: (*Titanium alloys, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Sheets, Spot welding, *Spot welds, *Welded joints, Tensile properties, Shear stresses, Thermal stresses, High temperature research, Fatigue (Mechanics), Tests.)

The fatigue strength of multiple spot welded joints in .060-in.-thick sheet material of the Ti alloys 4Al-3Mo-1V, 16V-2.5Al, and 6Al-4V were determined. The fatigue strength of the 3 alloys was 8-10% of the static strength of the spot welded joint. The alpha-beta alloy 4Al-3Mo-1V had the highest fatigue strength; the 16V-2.5Al, all beta alloy, the lowest. Data is also presented on the elevated temperature strength of spot welds and the effect of exposure to elevated temperature on room temperature strength of spot welds in the 4Al-3Mo-1V alloy. A uniform decrease in shear strength was noted with increase in temperature. At an exposure temperature of 600 F, the 4Al-3Mo-1V alloy retained its strength up to 250 hr exposure time. A uniform decrease in shear strength occurred after exposure at 900 F for 100 hr, but an anomalous increase in strength occurred after exposure of 1000 hr. (Author)

AD-269 262 Div. 17, 26
(TISTM/BRW) OTS price $2.60

Materials Advisory Board, National Research Council, Washington, D.C.
REPORT OF THE SUBPANEL ON CONSOLIDATION AND FABRICATION REFRACTORY METALS SHEET ROLLING PANEL.
1 Dec 61, 24p. (Rept. no. MAB-179-M)
(Contract DA 36-039-sc-76436)
Unclassified report

DESCRIPTORS: (*Refractory materials, *Metal plates, Sheets, Manufacturing methods, Processing, Powder metallurgy, *Tungsten, Impurities, Melting, Electric arcs, Electron beams, Casting, Rolling mills, Machining, Lathes.) Conferences.

The report recapitulates the highlights from three meetings concerned with consolidation, hot working, and warm-cold finishing. Discussions were not confined to any one refractory metal, nor did they in each case extend to all of the materials being produced. It is apparent that some problem areas are peculiar to one or other refractory alloy while other problem areas are common in varying degree to all. An attempt was made to catalogue the factors which bear upon the initial hot workability of sintered W sheet bar with physical attributes including: (1) a minimum sintered density of 90%. (2) a medium grain size, ASTM 6 to 8 (too fine a grain size requires high flow pressure and has a likelihood of brittleness; a coarse grain leads to a high unit grain boundary area segregation of impurities), (3) a pore distribution and size adequate to inhibit grain coarsening, and (4) a reduced level of interstitial impurities. (Author)

AD-269 265 Div. 17, 25
(TISTM/EJH) OTS price $1.10

National Research Corp., Cambridge, Mass.
THERMODYNAMIC PROPERTIES OF BI-METALLIC POWDERS. Quarterly letter rept. for Jan 62,
by Willem Versluys and Robert W. Steeves.
5 Jan 62, 4p. illus.
(Contract Nonr-360800, Proj. 44-1-226)
Unclassified report

DESCRIPTORS: (*Thermodynamics, Thermochemistry, *Combustion, *Powder metals, Powder alloys, *Intermetallic compounds, Metals.) (Silicon compounds, Aluminum compounds, Borides, Zirconium compounds, Lithium compounds, Titanium compounds.) (Aluminum, Hydrochloric acid.) (Laboratory equipment, Calorimeters, Vaporization, Electron beams, Induction heating, Refractory materials.)

The object of the program is to study the heats of combustion of intermetallic compounds as compared with mechanical mixtures of the corresponding metals. The program will consist of three parts: Preparation of ultrafine powders, bimetallic alloy (compound) systems, Al B, Zr Al, Zr Si, Al Li, and Ti Si, and of the corresponding elements; determination of the heats of formation of: the above binary compounds; and the oxides and related products of combustion of the above binary alloys; the preparation of research quantities for further evaluation. A Parr series #1200 adiabatic calorimeter was installed, and its heat equivalent determined. A few preliminary runs on the determination of the heat of combustion of Al metal powder revealed that this reaction is very violent. A few runs were made to explore the field of solution calorimetry. It was found that Al powders are slow to react with 1 N HCl at room temperature. Only at temperatures exceeding 55 C did reaction rates become high enough to complete the reaction in the course of minutes. (Author)

AD-269 276 Div. 17, 25, 4
(TISTM/GEC) OTS price $8.10

Materials Advisory Board, National Research Council, Washington, D. C.
REPORT OF THE SUBPANEL ON ANALYTICAL TECHNIQUES REFRACTORY METALS SHEET ROLLING PANEL MATERIALS ADVISORY BOARD.
Nov 61, 75p. incl. illus. tables (Rept. no. MAB-178-M)
(Contract DA 36-039-sc-76436)
Unclassified report

DESCRIPTORS: (*Refractory materials, Heat resistant alloys, *Analysis, *Metals, Chemical impurities, Tests, Tables.) (Niobium alloys, Molybdenum alloys, Tantalum alloys, Tungsten alloys.) (Test methods, Optics, Chemical analysis.)

Analytical techniques for major alloying constituents in the refractory metals were found

to be adequate. The main problem area in analysis continues to be determination of the interstitial elements, O, N, C, and H, at low levels. New methods of analysis included, mass spectrographic, emission spectroscopic, X-ray fluorescence, including the microprobe, internal friction, and low-temperature electrical resistivity. Methods for analysis of trace elements other than interstitials seemed adequate. The results of a survey of the status of analytical techniques for the refractory metals and their alloys are reported. (Author)

AD-269 289 Div. 17, 26
(TISTM/GEC) OTS price $7.60

Reactive Metals, Inc., Niles, Ohio.
PRODUCTION AND INVESTIGATION OF WELDABILITY OF ONE-INCH THICK TITANIUM 6Al-4V PLATE.
Final rept., 25 Nov 60-25 Oct 61,
by L. E. Stark, L. J. Bartlo, and H. G. Porter.
Nov 61, 64p. incl. illus. tables.
(Contract NOa(s)-56-994-c)
Unclassified report

DESCRIPTORS: (*Titanium alloys, Aluminum alloys, Vanadium alloys, *Sheets, *Welding, Welds, Processing, Production.) (Tests, Terminal ballistics, Fracture (Mechanics), Impact shock, Tensile properties, Hardness, Microstructure.) Mechanical properties.

One-in-thick Ti-6Al-4V plate was produced having good strength and a surface case of fine grained metal. Five groups of welded plates were evaluated by tensile and impact tes. The welds were deposited with Ti-6Al-4V filler wire, Ti-5Al-2.5Sn filler wire, MST 55 filler wire, MST 40 filler for root passes, Ti-6Al-4V filler for central and cover passes, MST 40 filler for root and cover passes, and Ti-6Al-4V filler for central passes. Test results indicated that welds made with Ti-5Al-2.5Sn filler wire had the best combination of strength and ductility. Three welded plates for each of the 5 groups and 3 unwelded plates will be tested by explosion crack-strter and drop-weight tests. (Author)

AD-269 346 Div. 17
(TISTM/EJH) OTS price $2.60

Aluminum Co. of America, New Kensington, Pa.
MECHANICAL PROPERTIES OF 7075-T6 STEPPED EXTRUSIONS,
by J. O. Lyst. 27 June 61, 10p. illus. tables.
(Rept. no. 9-61-18)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, Extrusion, Mechanical properties, Tensile properties, Fatigue (Mechanics), Failure (Mechanics), Fracture (Mechanics), Stresses, Shear stresses.) Airframes.

A study was made to determine the fatigue strengths and tensile properties at the step and in adjacent parts of the large and small ends of 7075-T6 stepped extrusions. The tensile and yield strengths are generally higher for specimens taken from the small end than those from the large end; also, the tensile properties of specimens from across the step are appreciably lower than those taken from either the large or small end of the extrusion. The fatigue strengths, regardless of location in the extrusion, were as good as or better than those considered typical for 7075-T6 products. There appeared to be no significant difference between the fatigue strengths of specimens taken from across the step and those from either the large or small end of the extrusion. (Author)

AD-269 347 Div. 17
(TISTM/TCG) OTS price $3.60

Aluminum Co. of America, New Kensington, Pa.
THE EFFECT OF RESIDUAL STRAINS UPON THE ROTATING-BEAM FATIGUE PROPERTIES OF SOME ALUMINUM ALLOYS,
by J. O. Lyst. 30 Sep 60, 13p. illus. tables.
(Rept. no. 9-60-34)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, Rotating structures, *Beams, Fatigue (Mechanics), Failure (Mechanics), Effectiveness, Stresses, Rods, Design, Surface area, Tensile properties, Impact shock, Pressure, Measurement.)

An attempt was made to demonstrate to what extent the fatigue strength of some Al alloys (6061-T6 and 7075-T6) is affected by changes in the strain, stress, or pattern in rod samples containing residual surface strain and also by inducing strains into notched specimens by preloading in either tension or compression prior to fatigue testing. Tests indicate that tensile residual surface strains in samples of 7075-T6 rod have no effect upon the rotating-beam fatigue properties of smooth or notched specimens, whereas compressive residual surface strains seem to increase the fatigue properties appreciably. The data also show that strains induced in notched specimens of 6061-T6 and 7075-T6 alloys have to be of rather large magnitude before they affect the fatigue properties. (Author)

AD-269 419 Div. 17
(TISTM/TCG) OTS price $4.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
EFFECT OF COLD-WORK AND ROLLING DIRECTION ON THE STRAIN HARDENING OF IRON.
Master's thesis,
by John Daniel Dalton. Aug 61, 44p. incl. illus. tables, 8 refs. (Rept. no. GAW/Mech 61-3)
Unclassified report

DESCRIPTORS: (Metals, *Iron, Rolling mills, Processing, Stresses, Hardness, Tensile properties, Thickness, Deformation, Measurement, Theory, Plasticity.) (Heat treatment, Chemical milling, Metallurgical analysis.) *Hardening.

The strain hardening of Ferrovac E high purity Fe was investigated in terms of the strain hardening exponent. Tensile tests were performed on specimens from material cold-worked by rolling from 0% to 90% in 10% increments and at orientations of 0, 22-1/2, 45, 67-1/2, and 90 degrees to the rolling direction. All tests were conducted at room temperature and at a constant strain rate. Yield strength, ultimate tensile strength, rate of strain hardening at maximum load, and the strain hardening exponent were determined. The value of the strain hardening exponent was reduced over 2/3 by the first 20% of cold-work. Amounts of cold-work greater than 50% have little effect. The results of that part of the investigation concerning the effect of rolling direction on strain hardening were inconclusive. (Author)

AD-269 424 Div. 17
(TISTM/GEC) OTS price $8.10

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
INVESTIGATION OF THE PLATINUM-RICH PORTION OF THE PLATINUM-TANTALUM PHASE DIAGRAM.

Master's thesis,
by Bob Dean Browning. Aug 61, 71p. incl. illus. tables, 8 refs. (Rept. no. GAW/Mech 61-1)
Unclassified report

DESCRIPTORS: (*Platinum, *Platinum alloys, *Tantalum alloys, Intermetallic compounds, Platinum compounds, Tantalum compounds, High temperature research, X-ray diffraction analysis, Metallurgical analysis, Phase studies, Microstructure.)

The Pt-Ta binary system was investigated at two isotherms; 1000 and 1500 C, and at 11 alloy compositions in the range of 50 to 100 at-% Pt. The alloys were examined by x-ray diffraction and metallography. Three intermetallic compounds, Pt2Ta, Pt3Ta, and Pt4Ta were found to exist in this composition range. The Pt4Ta intermetallic appeared only at the 1500 C isotherm. Pt dissolved Ta substitutionally to 90 at-% at 1500 C and to approximately 80 at-% at 1000 C. (Author)

AD-269 425 Div. 17
(TISTM/EJH) OTS price $10.50

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
A PHASE STUDY OF A SELECTED PORTION OF THE TI-Al-Zr TERNARY SYSTEM INCLUDING LATTICE PARAMETER DETERMINATIONS FOR THE Ti-Al PHASE.
Master's thesis,
by Doral Randolph Sandlin. Aug 61, 129p. incl. illus. tables, 14 refs. (Rept. no. GAW/Mech 61-6)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, *Tjtanium alloys, Zirconium alloys, *Brittle materials, *Phase studies, Crystal structure, Microstructure, Lattices, X-ray diffraction analysis, X-ray protography, Spectrographic analysis, Processing, Preparation.)

This investigation was conducted to determine if the Ti-Al system gamma phase c/a ratio of unity for the crystal structure could be obtained. Data obtained are compared with reported data in which the c/a ratio of unity was predicted. The conclusions drawn are that the c/a ratio of unity can not be obtained as predicted, and that phases other than the gamma phase are present in alloys at which the prediction was made. Coincident with the lattice parameter determinations, a study was made of the presence of phases in the region of the Ti-Al-Zr ternary system between 45 and 55 atomic % Al. Two, and possible 3, new phases were observed, but their identification was not undertaken. The results of the phase investigation are given. (Author)

AD-269 535 Div. 17, 25, 30
(TISTP/MFA) OTS price $.50

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
A TENSILE TESTING APPARATUS FOR SHORT FINE FILAMENTS WITH OPTICAL-MECHANICAL STRAIN MEASUREMENT.
Rept. for June 58-Oct 59 on Solid State Research and Properties of Matter,
by J. E. Emrick and H. L. Gegel. Sep 61, 9p. incl. illus. 5 refs.
(Proj. 7021)
(ASD TR 61-168) Unclassified report

DESCRIPTORS: (*Test equipment, Design, *Tensile properties, Metals, Iron, Magnesium, Filaments, *Optics, *Mechanical properties, Stresses.) (Elasticity, Calibration, Measurement, Tests, Errors.)

An apparatus was designed and built, which will obtain relatively accurate stress-strain curves of fine metallic filaments and whiskers. The principle of operation is based upon extension of a calibrated spring to apply the load. The strain is measured optically by projecting the gauge marks on two ground-glass plates attached to dial indicators. The magnitude of error in load and strain measurements is very slight. Stress-strain measurements of elastic moduli for two filament metals were made as a final check. (Author)

AD-269 541 Div. 17, 25
(TISTP/JW) OTS price $11.00

Institute of Engineering Research, U. of Calif., Berkeley.
ANALYSIS OF STRUCTURAL LAMINATES.
Rept. for 1 Feb 60-31 Jan 61,
by S. B. Dong, R. B. Matthiesen and others. Sep 61, 133p. incl. illus. tables, 26 refs.
(Contract AF 33(616)6910, Proj. 7063)
(ARL-76) Unclassified report

DESCRIPTORS: (Structural shells, *Elastic shells, Deformation, Deflection, Stresses.) (Mathematical analysis, Stresses.) (Elastic shells, Mechanical properties.) (*Laminates, Aluminum.)

A general small-deflection theory governing the elastostatic extension and flexure of thin laminated anisotropic shells and plates is formulated. The plate or shell structure may be composed of an arbitrary number of bonded layers, each of which may possess different thickness, orientation, and/or orthotropic elastic properties. Donnell-type equations for cylindrical shells and Poisson-Kirchhoff plate equations are explicitly discussed, along with procedures for determining stresses in an individual lamina. Several methods of solution of the system of equations governing extension and flexure of plates are discussed and illustrated with examples. Optimization of laminate configuration is treated briefly. The results of a limited number of crack propagation tests of flat plate aluminum foil laminates in uniaxial tension are presented. (Author)

AD-269 556 Div. 17, 14
(TISTM/LH) OTS price $7.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SPACE ENVIRONMENTAL EFFECTS ON GEARS AND BEARINGS. AN ANNOTATED BIBLIOGRAPHY.
Addendum to the Space Materials Handbook,
comp. by Helen M. Abbott. Oct 61, 72p. (Special bibliography no. SB-61-49; Rept. no. 3-34-61-12)
(Contract AF 04(647)673)
Unclassified report

DESCRIPTORS: (*Bibliography, *Space environmental conditions, Materials, Spaceships, *Bearings, *Gears, Lubrication.)

An annotated bibliography on gears and bearings, resulting from a general literature search as an aid to the consideration of design factors, temperature, speed effects and wear problems on materials that could give satisfactory service in spacecraft applications is presented. (Author)

Division 17 - METALLURGY

AD-269 596 Div. 17, 25
(TISTM/BRW) OTS price $1.00

Minnesota U., Minneapolis.
STRESS REDISTRIBUTION IN NOTCHED SPECIMENS UNDER CYCLIC STRESS.
Rept. for 31 Jan 57-30 June 61, on Materials Analysis and Evaluation Techniques,
by A. B. Blatherwick and Byron K. Olson.
Oct 61, 26p. incl. illus. 13 refs.
(Contract AF 33(616)6828, Proj. 7351)
(ASD TR 61-451) Unclassifiedreport

DESCRIPTORS: (*Steel, *Fatigue (Mechanics), Stresses, Deflection, Test methods, Metal plates, Cylindrical bodies, Elasticity, Plasticity, Hardening, Deformation.) (Test equipment, Strain gages, Loading, Tests, Theory.)

Most materials exhibit a change in stress-strain relationship when subject to fatigue stresses. The effect of this change on the stress distribution across the throat of notched plate specimens of mild steel is examined. The strain distribution across the specimens was determined under dynamic conditions for various numbers of cycles. Tests of unnotched specimens were used to obtain the cyclic stress-strain properties for corresponding numbers of cycles, and from these data the stress distribution in the notched specimens was determined. Good agreement was obtained between the integral of the stress distribution curve and the total load on the specimen. Tests in which the strain amplitude at the notch root was held constant revealed a decreasing maximum stress with fatigue cycles. In other tests in which the load amplitude was constant, the maximum stress amplitude decreased with number of fatigue cycles, despite an increasing strain amplitude. In both types of test, the stress concentration factor decreased with increasing average-stress amplitude, and a further decrease occurs with increasing number of fatigue cycles. (Author)

AD-269 607 Div. 17, 26, 27
(TISTM/BRW) OTS price $1.60

National Research Corp., Cambridge, Mass.
DEVELOPMENT OF TANTALUM-TUNGSTEN ALLOYS FOR HIGH PERFORMANCE PROPULSION SYSTEM COMPONENTS.
Quarterly rept. no. 8, 10 Jan-9 Apr 61,
by M. L. Torti. 9 Apr 61, 8p. incl. tables.
(Contract NOrd-18787)
Unclassified report

DESCRIPTORS: (*Rocket motor nozzles, *Tantalum alloys, *Tungsten alloys, Tantalum compounds, Carbides, Refractory materials, Heat resistant alloys, Refractory coatings, Exhaust gases, Erosion, Exhaust nozzles, Control surfaces.) (*Manufacturing methods, Casting, Machining, Sheets, Rods, Wire, Forging, Extrusion, Carbonization, Heat treatment, Physical properties, Mechanical properties.)

Nine material evaluation rocket motor (MERM) nozzles of carburized Ta and high W content Ta base alloys were delivered to Aerojet General-Sacramento for testing under A-3 conditions. The carburized inserts were fired; the carburized pure Ta failed, but the carburized Ta 10% W firings were successful. The uncarburized high W content nozzles were returned for carburizing. (Author)

AD-269 617 Div. 17, 26
(TISTM/TCG) OTS price $13.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
WELDING OF TITANIUM AND ITS ALLOYS (Svarka Titana I Ego Splavov),
by M. Kh. Shorshorov and G. V. Nazarov.
3 Aug 61, 179p. incl. illus. tables, 31 refs.
(Trans. no. MCL-925/1 of Gosudarstvenhoye Nauchno-Tekh-nicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moskva, 135p., 1959)
Unclassified report

DESCRIPTORS: (*Titanium, *Titanium alloys, *Welding, Welds, Arc welding, Arc welds, Electric welding, Spot welding, Welded joints, Processing, Production, Manufacturing methods.) (Heat treatment, Impurities, Welding fluxes, Soldering, Controlled atmospheres.) (Mechanical properties, Physical properties, Phase transitions.) USSR.

Basic properties and methods of producing Ti and its alloys are presented. The effect of composition of alloys and harmful impurities upon weldability is shown, features of heat processes during welding are examined, as well as the control of structure and properties of welded joints and the principles of choosing the conditions of welding and heat treatment. Arc welding in inert gases and under flux, electric slag welding, resistance welding and soldering are described. Basic areas of the use of welded constructions are indicated. (Author)

AD-269 623 Div. 17, 26, 27
(TISTM/EJH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
STRUCTURE FORMATION DURING SOLIDIFICATION OF TURBINE BLADES CAST IN INVESTMENT PATTERNS,
by F. V. Aksenov, N. F. Lashko, and Ye. Ya. Rodina, 7 Aug 61, 20p. (Trans. no. MCL-1051/1 of Trudy Chetvertogo Soveshchaniya Po Teorii Liteynykh Protsessov, Moscow:166-175, 1960)
Unclassified report

DESCRIPTORS: (*Turbine blades, *Heat resistant alloys, *Nickel alloys, *Chromium alloys, Iron alloys, Tungsten alloys, Casting, Hardening, Processing, Grains (Metallurgy), Lattices, Microstructure, Phase studies, Mechanical properties.) USSR.

An attempt was made to study the peculiarities of structure formation of heat resistant alloys cast under conditions close to those of solidification of cast turbine blades. When smelting alloys such as Ni-Cr-C and Ni-Cr-W-C, the metals W, Mo, Co and Al were introduced in a quantity amounting to 5%; Ti was added in a quantity amounting to 2%. During smelting the alloys were heated to 1450 or 1700 degrees and then poured into hot ceramic molds heated to 950 degrees. Heat treatment involved heating to 1200 degrees. Depending on solidification conditions, the tendency to macrostructural changes depended greatly upon the alloy composition. Common nichromes, and those alloyed with Mo, Co and Al were extremely sensitive to overheat; nichrome with an addition of Ti was only slightly sensitive to solidification rate and overheat.

AD-269 630 Div. 17, 12, 25
(TISTM/GEC) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
BREAKTHROUGH INTO SPACE,

by V. Parfonov. 8 Aug 61, 17p. incl. illus. (Trans. no. MCL-1185/1 of Znaniye - Sila 10:1-3, Oct 60) Unclassified report

DESCRIPTORS: (*Guided missile noses, Re-entry vehicles, Re-entry aerodynamics, *Refractory materials, Metals, Beryllium, Niobium, Molybdenum, Tantalum, Tungsten.) (Cooling by Sublimation, Thermal radiation and Magnetic fields.) USSR.

The materials for the body of the spaceship should protect the crew from the cosmic vacuum, withstand erosion when the skin is bombarded by cosmic dust, and withstand the impacts of small meteorites. A group of very refractory metals which must be heated to 3000 degrees and higher to be melted include Be, Nb, Mo, Ta, and W. The properties of these metals are discussed. (Author)

AD-269 639 Div. 17, 25
(TISTM/GEC) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ENTHALPY AND HEAT CAPACITY OF MOLYBDENUM IN THE 1200-2500 DEGREE K TEMPERATURE RANGE,
by L. S. Lazareva, P. B. Kantor, and V. V. Kandyba. 17 Aug 61, 5p. incl. tables, 7 refs. (Trans. no. MCL-1243 of Fizika Metallov I Metallovedeniya 2:628-629, 1961)
Unclassified report

DESCRIPTORS: (*Molybdenum, High temperature research, *Enthalpy, *Specific heat, Test methods, Thermochemistry, Thermodynamics.) USSR.

An experimental determination of the enthalpy of Mo in the 1164-2540 K range with an error of less than 1% was made. Measurements were based on the method of coalescence in a high-temperature vacuum device. (Author)

AD-269 674 Div. 17, 26
(TISTM/GEC) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CHARACTERISTICS OF EXTRUDING METAL BY HIGH-PRESSURE LIQUID AT ELEVATED TEMPERATURES,
by V. I. Beresnev, D. K. Bulychev, and K. P. Rodionov. 17 Aug 61, 13p. incl. illus. 16 refs. (Trans. no. MCL-1276/1 of Fizika Metallov I Metallovedeniye 11:115-122, 1961)
Unclassified report

DESCRIPTORS: (*Extrusion, *Metals, *Hydraulic systems, Liquids, *Pressure, Heat treatment, Deformation.) (Fatty acids, Mineral oils, Oils, Kerosene, Ethanols, Graphite, Additives, Chlorine, Phosphorous, Sulfur.) USSR, High temperature research, High pressure research, Lubricants.

Investigations of the process of extruding metals by a liquid under high pressure were made. The process of hydraulic extrusion of metals at elevated temperatures is described. This method reduced the force required to deform metals and indicated a possible method of solving the problem of working hard-to-deform metals by high-pressure liquid. (Author)

AD-269 710 Div. 17, 14
(TISTM/TCG) OTS price $14.50

Republic Aviation Corp., Farmingdale, N. Y.
COMPILATION OF UNPUBLISHED MATERIALS INFORMATION.
Quarterly rept. no. 1, 1 Apr-15 July 61. 15 July 61, 1v. incl. illus. tables (Rept. no. RAC 767-251(357))
(Contract AF 33(616)8084, Proj. 1(8-7381))
Unclassified report

DESCRIPTORS: (*Materials, *Alloys, *Metals, *Sandwich construction, Paper, Honeycomb cores, Plastics, Bearings.) (Mechanical properties, Tensile properties, Deformation, Stresses, Shear stresses, Fatigue (Mechanics), Failure (Mechanics), Heat treatment, Grains (Metallurgy), Aging.) (Aluminum alloys, Magnesium alloys, Titanium alloys, Steel, Iron alloys, Nickel alloys.) (Welding, Processing, Production, Test methods.) Tables.

Mechanical property data, not heretofore published, are presented for 16 materials. These data were obtained from materials programs conducted during the past 5 yrs. The following materials are contained in the data compilation: Al alloys - 2014, X2020, 7075, 7079; Mg alloys - HK31; Ti alloys - Ti-4Al-4Mn, Ti-5Al-2.5Sn; low alloy steel (90% Fe, or greater) - SAE 4340; high alloy steels (less than 90% Fe) - W-545, A1S1 431, AM-350, PH15,Mo; Ni alloys - M-252, U-500; sandwich material - Kraft paper honeycomb; and bearings - staking of bearings with plastics. (Author)

AD-269 711 Div. 17, 14
(TISTM/TCG) OTS price $12.00

Republic Aviation Corp., Farmingdale, N. Y.
COMPILATION OF UNPUBLISHED MATERIALS INFORMATION.
Quarterly rept. no. 2, 16 July-15 Oct 61. 12 Oct 61, 1v. incl. illus. tables. (Rept. no. RAC 767-252(357-1))
(Contract AF 33(616)8084, Proj. 1(8-7381))
Unclassified report

DESCRIPTORS: (*Alloys, *Materials, *Metals, Metallic compounds, *Elastomers, Fluids, *Lubricants, *Adhesives, *Plastics.) (Mechanical properties, Tensile properties, Deformation, Hardness, Heat treatment, Elasticity, Fatigue (Mechanics), Failure (Mechanics), Test methods.) (Aluminum alloys, Titanium alloys, Steel, Nickel alloys, Chromium alloys, Manganese alloys, Iron alloys, Vanadium alloys.) (Welding, Welded joints, Brazing, Extrusion, Bonding, Processing, Production.) Tables.

Mechanical property data, not heretofore published, are presented for 16 materials. These data were obtained from materials programs conducted by the Republic Aviation Corporation during the past 5 yr. The following materials are contained in the data compilation: Al alloys - 7075, 2024, X2219; Ti alloys - Ti-6Al-4V, Ti-8Mn; low alloy steels (90% Fe, or greater) - A1S14330 Mod; high alloy steels (less than 90% Fe) - PH15-7Mo, AM-355, 17-7PH, AM-357; Ni alloys - Inconel X, Inconel 700, Rene' 41; adhesives - Locktite, structural adhesives; and miscellaneous special purpose materials - plaster parting agents. (Author)

AD-269 729 Div. 17
(TISTM/GEC) OTS price $9.10

Aerospace Corp., El Segundo, Calif.
BERYLLIUM OXIDE. A LITERATURE SURVEY,

comp. by Theodore Cheron. 1 Sep 61, 93p. 283 refs. (Rept. no. TDR-930(2240-01)TN-1) (Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Beryllium compounds, Oxides, Ceramic materials, Beryllium, Intermetallic compounds, *Beryllium alloys, *Refractory materials, *Bibliography.) Toxicity, Crystal structure, Physical properties, Mechanical properties, Manufacturing methods.

This bibliography consisting of 283 entries covers the period from 1955 to 1961. The emphasis is on BeO, its physical, chemical and mechanical properties, preparation and fabrication methods. Some information is given on intermetallic compounds of Be and its alloys. The third part includes the toxicity of Be and BeO and safety measures. In preparation of this bibliography the open literature sources, pertinent indexes, abstracting journals, unclassified reports, and ASTIA holdings were consulted. (Author)

AD-269 739 Div. 17, 26
(TISTM/BRW) OTS price $1.10

Solar Aircraft Co., San Diego, Calif.
DEVELOPMENT OF LOW TEMPERATURE BRAZING OF TUNGSTEN FOR HIGH TEMPERATURE SERVICE.
Interim rept. no. 4, 16 Sep-15 Nov 61.
15 Dec 61, 6p. incl. illus. tables, 2 refs.
(Rept. no. RDR 1249-4)
(Contract NOw 61-0414-c)
Unclassified report

DESCRIPTORS: (Refractory materials, *Tungsten, *Brazing, Silver solders, Low temperature research.) (Soldering alloys, Platinum alloys, Boron alloys, Additives, Powder alloys, Powder metals, Tungsten.) (Welded joints, Metal joints, Diffusion, Melting, Heat treatment, Chemical reactions, Thickness.) (Tungsten compounds, Borides, Additives, Titanium, Zirconium, Thin films, Foils, Tests.)

Remelt separation temperature was determined for specimens brazed with Pt-2.1B alloy, with and without W powder additions. Joint thickness study is continuing. Additions of Ti or Zr to joints made with Pt-3.0B alloy were not effective in raising remelt temperature. (Author)

AD-269 753 Div. 17
(TISTM/GEC) OTS price $2.50

Materials Processing, TAPCO, Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
DEVELOPMENT AND EVALUATION OF HIGH TEMPERATURE PROTECTIVE COATINGS FOR COLUMBIUM ALLOYS. PART II. COATING EVALUATION.
Rept. for Apr 60-June 61 on Metallic Materials, by R. A. Jefferys and J. D. Gadd. Sep 61, 103p. incl. illus. tables.
(Contract AF 33(616)7215, Proj. 7351)
(ASD TR 61-66, pt. 2) Unclassified report

DESCRIPTORS: (*Refractory coatings, *Niobium alloys, Titanium alloys, Molybdenum alloys, Tungsten alloys, Zirconium alloys, *Niobium, High temperature research, *Heat resistant alloys.) (Oxidation, Erosion, Thermal stresses, Mechanical properties.) *Oxidation inhibitors.

A comparative evaluation was made of 18 coating-base metal systems, six different coatings applied to 3 Nb base materials (D-31 alloy, F-48 alloy and unalloyed Nb). The 18 coating-base metal systems were tested under the same conditions in cyclic oxidation (2300 and 2500 F), thermal shock (2500 to 250 F), bend-oxidation (2500 F) and stress-oxidation (2500 F) plus tensile tests. The tests produced directly comparable data between the coating-base metal systems relating to the protective nature of each coating and the effect of the coating and the coating treatment on the mechanical properties of the substrate. (Author)

AD-269 763 Div. 17, 26
(TISTM/BRW) OTS price $3.60

Sylvania Electric Products, Inc., Towanda, Pa.
DEVELOPMENT AND PRODUCTION OF IMPROVED MOLYBDENUM SHEET BY POWDER METALLURGY TECHNIQUES.
Interim rept. no. 11, 1 Aug-30 Sep 61, by Roger B. Bargainnier. 15 Dec 61, 26p. incl. illus. tables.
(Contract NOa(s) 60-6018-c)
Unclassified report

DESCRIPTORS: (*Sheets, *Molybdenum, *Molybdenum alloys, Titanium alloys, Carbon alloys, Production, Rolling mills.) (Physical properties, Powder metallurgy, Controlled atmospheres, Sintering, Additives, Temperature, Tensile properties, Stresses, Rupture, Brittle materials, Transition temperature, Phase transitions, Heat of fusion, Crystal structure, Density, Grains (Metallurgy).) (Heat resistant alloys, Processing, Sintering vs Melting, Electric arcs, Casting.)

Mo-Ti and Mo-Ti-C sheets rolled from slabs sintered at 2150 C were evaluated for composition, recrystallization temperature, tensile properties at room-temperature and 1200 C, 1200 C stress-rupture properties and ductile-brittle transition temperature. The results were examined along with results from previous sheet evaluations. The dependency of sheet properties on variations in alloy form and concentration and sintering conditions was determined. The sintering temperature of the slabs had the greatest effect on sheet properties. The test results verified that high-temperature properties of powder-metallurgy sheet produced from a mixture of Mo with 0.5% Ti and 0.1% C sintered at 2150 C are superior to those of the compositional counterpart sintered at 1800 C and to those of commercial arc-cast Mo-0.5Ti-C sheet. (Author)

AD-269 773 Div. 17, 4, 25
(TISTM/BRW) OTS price $8.10

Westinghouse Electric Corp., Pittsburgh, Pa.
OXIDATION OF TUNGSTEN AND TUNGSTEN BASED ALLOYS.
Rept. for Aug 59-Dec 60 on Metallic Materials, by P. E. Blackburn, K. F. Andrew and others. June 61, 74p. incl. illus. tables, 22 refs.
(Contract AF 33(616)5770, Proj. 7351)
(WADC TR 59-575, pt. 2) Unclassified report

DESCRIPTORS: (Refractory materials, *Tungsten, *Tungsten alloys, Tantalum alloys, *Oxidation, Chemical reactions, Reaction kinetics, High temperature research, Tungsten compounds, Oxides, Vapor pressure, Thermodynamics, Heat of formation.) (Test equipment, Vacuum furnaces, Temperature, Pressure, X-ray diffraction analysis, Microphotography, Heating, Induction heating.)

The results of studies related to the oxidation of W and its alloys are studied. The pressure

of WO3 polymers over WO2 was measured in a W Knudsen cell and found to agree with measurements in a Pt cell. Literature data for WO2 WO3 were combined with vapor pressures determined in this project to give thermodynamic values for W18049 and W20058. W oxidation rates were measured from 800 to 1700 C and in O pressures between 0.2 and 0.02 atmospheres. The effects of O pressure indicate that the rate may be governed by O dissociating to atoms at the reacting surface. The oxidation rate is demonstrated to be independent of the oxide evaporation rate. All of the evidence indicates that if an oxide barrier layer is present at temperatures above 800 C it must be very thin. Studies on the oxidation of Ta - W alloys between 800 and 1200 C indicate that the 50-50 alloy has the greatest oxidation resistance, oxidizing at a rate as much as 10 times slower than W alone. (Author)

AD-269 777 Div. 17
(TISTM/BRW) OTS price $1.00

Watertown Arsenal Labs., Mass.
BRITTLE FRACTURE TRANSITION-TEMPERATURE CORRELATIONS IN CONSTRUCTIONAL ALLOY STEELS.
Rept. on Research of Metals and Nonmetallic Materials for Ordnance Construction,
by George M. Orner and Carl E. Hartbower. Dec 61, 38p. incl. illus. 16 refs. (Technical rept. no. WAL TR-112/87-9)
(D/A Proj. 593-32-002)
Unclassified report

DESCRIPTORS: (Metal plates, *Steel, Failure (Mechanics), *Fracture (Mechanics), Brittle materials, *Transition temperature, Propagation, Test methods, Theory, Impact shock, Stresses, Plasticity, Deformation.)

A correlation was sought between the low-blow transition temperature (LBTT) and the temperatures at which brittle fracture occurred in 4 service casualties. Comparisons were made between the LBTT and the Naval Research Laboratory drop-weight nil-ductility transition (NDT) temperature, wide-plate crack-arrest temperature, and the maximum temperature at which brittle fracture would propagate in special wide-plate crack propagation tests. Low-blow transition-temperature tests were made using large (1.2 sq-in. cross section) Charpy specimens in 2 steels on which similar tests were made with specimen sizes ranging from one-half to double standard size. In service-casualty materials, the LBTT and NDT correlated within 20 C. Comparison between LBTT and wide-plate crack-arrest temperatures indicated near one-to-one correlation. In special crack-propagation tests with self-stressed specimens, the maximum temperature at which brittle fracture would propagate was below the LBTT, probably because of the low stresses involved. The LBTT determined from the oversized Charpy specimens confirmed earlier observation that the LBTT is independent of specimen size. (Author)

AD-269 778 Div. 17, 26
(TISTM/BRW) OTS price $1.25

Watertown Arsenal Labs., Mass.
HOT ROLLING OF COMMERCIALLY PURE TITANIUM AND TITANIUM ALLOY Ti-6Al-4V.
Rept. on Research of Materials for Lightweight Construction,
by Eugene DiCesare. Dec 61, 50p. incl. illus. table, 4 refs. (Technical rept. no. WAL TR-401.5/3)
(D/A Proj. 593-32-003)
Unclassified report

DESCRIPTORS: (*Titanium, *Titanium alloys, Processing, Sheets, Rolling mills, Temperature, Pressure, Torque, Thickness, Reduction, Velocity, Manufacturing methods.) (Structures, Materials.)

Rolling forces and torque were experimentally determined in hot rolling commercially pure Ti and Ti 6Al-4V alloy on a 2-high experimental rolling mill with 5-1/4 in.-outside diam rolls. Rolling temperatures were 1400, 1600, 1800, and 2000 F; specimen widths 1, 2, and 4 in.; and specimen thicknesses 1/32, 1/16, and 1/8 inch. Results are presented in the form of curves showing the effects of reduction, rolling temperature, specimen size, and alloy on roll separating force, specific pressure, horsepower and work, forward slip, lever arm ratio and spread. (Author)

AD-269 779 Div. 17, 25
(TISTM/BRW) OTS price $5.60

Watertown Arsenal Labs., Mass.
RELATIONSHIPS BETWEEN ENERGY, FIBROSITY AND TEMPERATURE IN CHARPY IMPACT TESTS ON AISI 4340 STEEL.
Rept. on Research of Metals and Nonmetallic Materials for Ordnance Construction,
by Frank R. Larson and John Nunes. Dec 61, 49p. incl. tables, 11 refs. (Technical rept. no. WAL-TR-834.2/3)
(DA Proj. 593-32-002)
Unclassified report

DESCRIPTORS: (*Steel, *Fracture (Mechanics), Energy, Transition temperature, Plastic flow, Tensile properties, Deformation, Hardening, Microstructure, Tests, Impact shock.) (Martensite, Bainite, Pearlite.)

A study was conducted on the relationships between impact energy, percent fibrosity and test temperature in the Charpy tests for AISI 4340 steel. It is shown that a linear function of percent fibrosity versus energy exists. Also an energy value (U sub F) derived from this function is shown to be related to basic strain-hardening properties. A relationship, based upon the rate of change in U sub F with respect to temperature, was established. It was possible to describe the appearance of the fracture by identifying three regions of behavior, namely, shear lip, center fibrous and flat. The flat region can be considered representative of rapid fracture while the center fibrous would indicate slow ductile fracture, rapid and slow being defined in this study by unstable and stable fracture propagation. (Author)

AD-269 784 Div. 17, 25
(TISTM/BRW) OTS price $1.25

Defense Metals Information Center, Columbus, Ohio.
THE EMITTANCE OF CHROMIUM, COLUMBIUM, MOLYBDENUM, TANTALUM, AND TUNGSTEN,
by W. D. Wood, H. W. Deem, and C. F. Lucks.
10 Dec 61, 47p. incl. illus. 24 refs.
(DMIC Memo. no. 141)
Unclassified report

Division 17 - METALLURGY

DESCRIPTORS: (Metals and Alloys of *Chromium, *Molybdenum, *Niobium, *Tantalum, *Tungsten.) (*Thermal radiation, Thermionic emission, Blackbody radiation, Heat transfer, Monochromatic light, Absorption, Brightness, Reflection.) (Test equipment, Thermocouples, Thermopiles, Optical equipment, Radiation pyrometers, Spectrophotometers, Thermistors.) Data,Tables.

A compilation is presented of original test data on emittance, reflectance, and adsorptance of Cr, Nb, Mo, Ta, and W. The data were taken from the literature published during the period 1940-1959 inclusive, and as much of the 1960 literature as could be obtained. The following sources were searched: Chemical Abstracts, Ceramic Abstracts, Metallurgical Abstracts, Nuclear Science Abstracts, and the files of the Defense Metals Information Center (DMIC). An attempt was made to evaluate these sources of data according to the apparent thoroughness of methods and techniques as described by the various investigators. In many cases the descriptions in the literature are a summary of methods and results, and a complete evaluation is impossible. Curves are presented which appear to indicate the most probable values for the various conditions and materials. (Author)

AD-269 799 Div. 17, 14
(TISTM/BRW) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
HIGH-TEMPERATURE OXIDATION PROTECTIVE COATINGS FOR VANADIUM-BASE ALLOYS.
Bimonthly progress rept. no. 3, 12 Oct-11 Dec 61, by F. C. Holtz. 8 Jan 62, 15p. incl. illus. (Rept. no. ARF 2227-3)
(Contract NOw-61-0806-c)
Unclassified report

DESCRIPTORS: (*Vanadium alloys, Titanium alloys, Niobium alloys, High temperature research, *Antioxidants, *Oxidation inhibitons, Ceramic coatings, *Metal coatings, *Refractory coatings, Zinc coatings, Silicon coatings.) (Flame spraying, Vapor plating, Thin films, Oxides, Intermetallic compounds, Silicides.) (Yttrium compounds, Nickel compounds, Iodine compounds.) (Nickel alloys, Magnesium alloys, Zinc alloys, Aluminum alloys, Iron alloys, Chromium alloys.)

Oxidation-protective coatings for vanadium alloys were investigated for use at 2000 F and above. Coatings of flame-sprayed Ni on V-1Ti-60Nb afforded protection for over 60 hr at 2000 F without evidence of failure, and initial oxidation tests at 2200 F also indicate promise. A glassy phase is formed on the outer surface after relatively short exposure to air, and the self-healing capabilities of this phase are being investigated. Pack-cementation siliconized coatings applied under Ar at 2200 F, using NaF as an activator, were protective on V-1Ti-60Nb for 500 hr at 2000 F and 283 hr at 2200 F without failure. Initial tests of the siliconized coating on V-5Ti-20Nb show no signs of failure after 30 hr at 2000 and 2200 F. (Author)

AD-269 826 Div. 17, 27
(TISTM/REB) OTS price $1.10

Aerojet-General Corp., Azusa, Calif.
INVESTIGATION OF STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS.
Informal progress rept. no. 12, 1-30 Nov 61. 11 Jan 62, 5p. tables (Rept. no. L0414-01-12)
(Contract DA 04-495-ORD-3069)
Unclassified report

DESCRIPTORS: (*Alloys, *Steel, *Stainless steel, *Titanium alloys, Stresses, Corrosion, Fracture (Mechanics).) (Rocket cases, Materials.) (Corrosive liquids, Corrosive gases, Solutions, Solid rocket propellants.)

Six alloys are being evaluated in 11 different environments. Specimens of Ladish D6AC, Type 300M, and Vascojet 1000 alloy steels, AM355 and PH 15-7 Mo stainless steels, and B120VCA Ti alloy are being tested in air, distilled water, tap water, 0.25% sodium dichromate solution, 1% marquench salt solution, 3% sodium chloride solution, trichloroethylene, cosmoline, 4% soluble-oil solution, high humidity atmosphere, and solid propellant. No failures were observed with any of the specimens exposed to laboratory air, the sodium dichromate solution, the marquench salt solution, the solution of Chevron's soluble oil, or the high humidity. An environment of distilled water was the most conducive to stress-corrosion cracking. Some failures were observed in all the other environments. (Author)

AD-269 856 Div. 17, 26
(TISTM/REB) OTS price $2.60

Climax Molybdenum Co. of Michigan, Detroit.
INVESTIGATION OF MOLYBDENUM-AND TUNGSTEN-BASE ALLOY SHEET MATERIALS.
Quarterly rept. no. 1, 24 Aug-24 Nov 61, by Gordon D. McArdle, Robert Q. Barr, and M. Semchyshen. 24 Nov 61, 22p. incl. tables.
(Contract NOw 61-0581-d)
Unclassified report

DESCRIPTORS: (Sheets, *Molybdenum alloys, *Tungsten alloys, Extrusion, Processing, Electric arcs, Vacuum furnaces, Casting, Heat treatment, Crystallization.)

Of the 28 extrusion blanks prepared from the six vacuum-arc-case, molybdenum - and tungsten-base alloy ingots, 24 were successfully extruded and 4 stuck in the die during extrusion. Two sheet bars from each of the five compositions have been rolled to 50-mil-gage sheet stock. Processing history, recoveries, and recrystallization data are presented. (Author)

AD-269 862 Div. 17
(TISTM/REB) OTS price $3.60

Committee on Ship Structure, National Research Council, Washington, D. C.
ON EFFECTS OF CARBON AND MANGANESE CONTENT AND OF GRAIN SIZE ON DYNAMIC STRENGTH PROPERTIES OF MILD STEEL.
Final rept. on Proj. SR-142, by J. M. Krafft and A. M. Sullivan. 27 Dec 61, 28p. incl. illus. tables, 22 refs. (Serial no. SSC-139)
(Contract NObs-84321; In cooperation with Naval Research Lab., Washington, D. C.)
Unclassified report

DESCRIPTORS: (*Steel, Mechanical properties, Plastic flow, Fracture (Mechanics), Stresses, Impact shock.) (Additives, Carbon, Manganese.) Grains (Metallurgy).

The exceptionally low ductility of mild steel

when separated by a rapidly moving crack may be attributed in part to its plastic flow strain-rate sensitivity. The elevation in yield strength under conditions of rapidly rising stress adjacent to the crack tip suppresses formation of the energy-absorbing plastic zone. Variation in composition, particularly of C and Mn content which affect the notched bar impact transition temperature, should also affect strain-rate sensitivity if this description is applicable. The general trends in yield point strain-rate sensitivity are found in agreement with effects of composition on the Charpy transition temperature. A good correlation is found to exist between the parameter k, found from the grain size dependency of dynamic upper yield strength, and the transition temperature expectancy for given composition. Plastic flow stress, at given high strain rate, can be correlated with free path in ferrite better than with ferrite grain size. (Author)

AD-269 873 Div. 17, 25
(TISTM/TCG) OTS price $3.60

Israel Inst. of Tech., Haifa.
LONG-RANGE ORDER IN Fe RICH Fe-Al ALLOYS. V. ROOM TEMPERATURE DEFORMATION BEHAVIOR,
by B. Z. Weiss and P. S. Rudman. Aug 61, 19p. illus. 36 refs. (Scientific note no. 9)
(Contract AF 61(052)122)
(ARL-224) Unclassified report

DESCRIPTORS: (*Phase studies, Phase transitions, *Molecular association of Iron in *Iron alloys, *Aluminum alloys, Deformation, Temperature, Heat treatment.) (Polymers, Crystals, Single crystals, Lattices, Crystal structure, Shear stresses, Tensile properties, Strain gages, X-ray diffraction analysis.)

The room temperature deformation behavior of Fe-Al alloys near the composition Fe3Al was studied as a function of quenching temperature (degree of order). A slip trace study showed (110) to be the dominant slip plane with (211) and (321) also participating. The relative slip plane preference was independent of the quenching temperature. The yield stress of polycrystalline specimens and the critical resolved shear stress of single crystals was determined as a function of quenching temperature. A second strength maximum was also observed in the 700 to 750 C quenching temperature range; x-ray results showed complete suppression of Fe3Al type order, and no variation in the degree of retained FeAl type order. A third strength vs quenching temperature rise was observed at about 900 C, which it is suggested may be due to vacancy strengthening. Young's modulus exhibited anomalous behavior, increasing with increasing quenching temperature. The Young's modulus behavior did not correlate with the disordering of the Fe3Al superlattice. (Author)

AD-269 875 Div. 17, 25
(TISTM/EJH) OTS price $1.10

Israel Inst. of Tech., Haifa.
EFFECT OF ORDER-DISORDER PHENOMENA ON THE STRENGTH OF HIGH TEMPERATURE ALLOYS.
Final rept.,
by P. S. Rudman. Sep 61, 5p. 9 refs. (Scientific note no. 10)
(Contract AF 61(052)122)
(ARL-225) Unclassified report

DESCRIPTORS: (*Heat resistant alloys, *Aluminum alloys, *Iron alloys, Phase studies, Phase transitions, Crystal structure, X-ray diffraction analysis, Heat treatment, Deformation, Mechanical properties.)

A summary research is presented including: (1) development of a phase diagram in the Fe rich region of the Fe-Al system; (2) x-ray diffraction studies of long range order in some alloys of Fe3Al composition; (3) FeAl-Fe3Al transformation studies; (4) electron band theory applied to the existence of order in Fe rich Fe-Al alloys; (5) general calculations for ordering mechanisms; and (6) the effect of quenching temperature on room temperature deformation behavior of alloys near the composition Fe3Al.

18. MILITARY SCIENCES AND OPERATIONS

AD-269 102 Div. 18, 6, 9, 25
(TISTP/WH) OTS price $4.60

RCA Defense Electronic Products, Moorestown, N. J.
SIMULATION STUDIES ON THE ELECTROMAGNETIC PROPERTIES OF THE WAKE OF A RE-ENTRY BODY.
Rept. on Down-Range Anti-Missile Measurement Program,
by Allan I. Carswell. Dec 61, 38p. incl. illus. 24 refs. (DAMP technical monograph no. 61-10)
(Contract DA 36-034-ORD-3144)
(ARPA Order no. 51) Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, *Aerial targets, Guided missiles, Detection.) (Simulation, *Electromagnetic properties, Wake, Condensation trails, *Re-entry vehicles, Re-entry aerodynamics.) (Experimental data, *Plasma physics, *Electromagnetic waves, *Supersonic flow, Measurement, Microwave probes, Wave transmission, Reflection, Turbulence.)

The initial phases of an experimental program on the laboratory simulation of the electromagnetic properties of the wake of a re-entry body are described. The scaling considerations involved in the comparison of the laboratory and full-scale systems are discussed, and the flow system which was developed is described. The results of several plasma diagnostic methods are presented. These include a flow visualization technique, high speed microwave transmission and reflection measurements on supersonic plasma flow streams, and floating double probe measurements in nonstationary plasmas. Many interesting phenomena which were observed, including turbulence in the plasma stream, are described. (Author)

Division 18 - MILITARY SCIENCES AND OPERATIONS

AD-269 218 Div. 18, 6, 2, 25
(TISTP/WH) OTS price $8.60

Eastman Kodak Co., Rochester, N. Y.
SPACE BACKGROUND STUDY.
Final rept.,
by Philip E. Barnhart, Anthony J. G. Prasil and others. 6 Dec 61, 99p. incl. illus. tables, 8 refs. (Rept. no. EK/ARD ED-735)
(Contract DA 30-069-ORD-2803; In cooperation with Ohio State U. Research Foundation)
(ARPA Order no. 39-60, Task 12)
Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, Optical systems, *Infrared optical systems, Design, *Aerial targets, Detection, *Astronomical data, *Infrared radiation, *Star models, Blackbody radiation, Theory, Literature.) (*Infrared radiation, Measurement, Instrumentation, *Infrared optical systems, *Photometers, Design, Construction, Telescopes.)

A summary report is presented of a two-year effort to obtain and present astronomical data designed to show the nature and extent of the infrared space background. Emphasis in the first phase was placed on historical and theoretical considerations of the problem. A summary table of the computed infrared magnitudes of 235 stars in three infrared wavebands is presented, based on the assumption that stars radiate as blackbodies over their entire spectral range. The second phase was designed to test the foregoing assumption by observing and measuring, in the infrared, a number of selected astronomical sources. To this end, two infrared photometer systems were designed, constructed and employed on the Perkins and Mount Wilson Observatories' telescopes. The results of the observations made with these photometers from October, 1960 to September, 1961, are presented. (Author)

AD-269 680 Div. 18, 8, 30
(TISTW/DLW) OTS price $8.60

Planning Research Corp., Los Angeles, Calif.
CONSIDERATION OF STATE-OF-THE-ART OF DISPLAY EQUIPMENT FOR USE IN A TEAS SIMULATION RESEARCH FACILITY,
by R. K. Fox. 30 Oct 61, 91p. incl. illus. tables, 57 refs. (Rept. no. PRC R-193; Scientific rept. no. 3)
(Contract AF 19(604)7351)
(AFCRL-976) Unclassified report

DESCRIPTORS: (*Military operations, *Air force operations, *Display systems, *Data processing systems, Computers, Television display systems, Cathode ray tube screens, Cathode ray tubes, Optical images, Command systems, Control systems, Warfare, Simulation, *Test facilities, Operations research.)

The state-of-the-art of display techniques, equipments, and computers is discussed. Such considerations are made to facilitate the objective of implementing a research facility for evaluating TEAS (threat evaulation and action selection) concepts. Hardware considerations are presented in as general a manner as possible consistent with the intended use in a TSRF (TEAS simulation research facility). Specifically discussed are open-loop response as affected by user requirements, display equipment characteristics, and computer equipment characteristics. Some discussion of closed-loop facility response is included. (Author)

AD-269 693 Div. 18
(TISTW/DLW) OTS price $4.60

Planning Research Corp., Los Angeles, Calif.
CONCEPTS AND OBJECTIVES FOR A THREATEVALUATION/ACTION SELECTION SIMULATION RESEARCH FACILITY,
by J. D. Dodson, R. K. Fox and others.
15 Feb 61, 35p. incl. illus. (Rept. no. PRC R-191; Scientific rept. no. 1)
(Contract AF 19(604)7351)
(AFCRL-142) Unclassified report

DESCRIPTORS: (*Military operations, *Air force operations, *Display systems, Data processing systems, Command systems, Control systems, Warfare, Simulation, *Test facilities, Operations research.)

The importance of timely Threat Evaluation and Action Selection (TEAS) in the post-1970 era is paramount in the face of: (1) advances in weapons technology leading to tremendous increases in lethality and speed of delivery, and (2) the probable and highly undesirable consequences of selecting a wrong action. Preliminary considerations are presented which should affect the design of a facility to be used for the simulation of a post-1970 TEAS activity. Emphasized are the environmental and conceptual requirements for research and experimentation in the concepts and techniques of post-1970 TEAS. (Author)

AD-269 889 Div. 18, 32
(TISTB/MS) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
STUDIES IN DETERRENCE. IV. THE PROSPECTS FOR FUTURE ARMS-CONTROL NEGOTIATIONS,
by Louis B. Sohn. Oct 61, 38p. (Rept. no. NOTS TP 2770)
Unclassified report

DESCRIPTORS: (*Foreign policy, *Political science, *USSR, Control of War potential.)

While general speculations on the future policy of the Soviet Union encounter many difficulties, the fact that the Soviet negotiators have followed a distinct pattern in the arms-control area permits an extrapolation of trends into likely alternatives within broad limits. Three of these are considered in detail, together with likely U. S. responses. These include (a) Soviet proposals for general and complete disarmament, (b) Soviet proposals for limited arms-control measures, and (c) Soviet proposals based on U. S. ideas developed during the last few years. Each is explored in some detail together with possible U. S. responses. (Author)

19. NAVIGATION

AD-269 229 Div. 19
(TISTW/DLW) OTS price $2.60

Minneapolis-Honeywell Regulator Co., Minn.
HIG-4 SPIN-MOTOR ROTATION DETECTOR DEVELOPMENT AND QUALIFICATION PROGRAM. VOLUME I.
Final rept.,
by R. W. Kopp. 30 Apr 60, 22p. incl. illus.
(MH Aero rept. no. 2053-TR4)
(Contract AF 04(647)110)
Unclassified report

DESCRIPTORS: (*Gyroscopes, *Signal generators, Monitors, Rotation, Spin, Detectors, Magnets, Design, Temperature, Shock resistance, Vibration, Acceleration, Tests, Reliability.)

The results are summarized of the modification and subsequent test program directed toward the incorporation of a spin-motor rotation monitoring device in the HIG-4 gyro. The modification consists primarily of inclusion of a variable reluctance signal pickoff within the gyro gimbal (or float). The pickoff is designed to develop two voltage pulses per revolution of the motor wheel. Thus, at a motor speed of 400 revolutions per second, a signal of 800 pulses per second is generated. The duration and peak-to-peak amplitude of each pulse are approximately 0.4 millisecond and 0.2 volt, respectively, across a 600-ohm load resistance. Gyros incorporating these design changes were exposed to high and low temperature, shock, vibration, and acceleration qualification tests. Pickoff performance was unaffected by these environments. (Author)

AD-269 230 Div. 19
(TISTW/DLW) OTS price $1.60

Minneapolis-Honeywell Regulator Co., Minn.
GG87 SPIN-MOTOR ROTATION DETECTOR MECHANIZATION AND EVALUATION.
Final rept.,
by W. L. Olson. 20 Feb 61, 11p. incl. illus. tables (MH Aero rept. no. 2053-TR5)
(Contract AF 04(647)110)
Unclassified report

DESCRIPTORS: (*Gyroscopes, *Signal generators, Miniature electronic equipment, Rotation, Spin, Monitors, Detectors, Magnets, Design, Sensitivity, Reliability, Tests.)

The methods are described by which a GG87B wide-angle miniature integrating gyro was altered to include a spin-motor rotation monitoring device. Test data from the evaluation program are also included. The spin-motor running detector addition consists of 4 permanent magnets embedded in the spin-motor momentum ring and 2 wire-wound coils on the gyro case. The system is designed to produce a sine wave output of 2 cycles per motor revolution, or 800 cps. The amplitude of the 800-cycle signal produced by this gyro was 600 millivolts rms into a 10,000-ohm resistive load. The gyro was given the customary performance tests and met all the requirements. (Author)

AD-269 613 Div. 19
(TISTP/WH) OTS price $19.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THEORY OF RANDOM FUNCTIONS AND ITS APPLICATION TO PROBLEMS OF AUTOMATIC CONTROL (Teoriya Sluchaynykh Funktsiy I Yeye Primeneniye K Zadacham Avtomaticheskogo Upravleniya),
by V. S. Pugachev. 3 Aug 61, 300p. incl. illus.
(Trans. no. MCL-900/1 of Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury, pp. 593-825, Moskva, 1960)
Unclassified report

DESCRIPTORS: (*Control systems, Synthesis, Statistical functions, Automatic, Functions.) USSR.

AD-269 637 Div. 19
(TISTP/WH) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
DUAL CONTROL THEORY, IV.,
by A. A. Feldbaum. 17 Aug 61, 22p. incl. illus. 4 refs. (Trans. no. MCL-1223/1 of Avtomatika I Telemekhanika 22:129-142, 1961)
Unclassified report

DESCRIPTORS: (*Control systems, Synthesis, Memory devices, Theory, Vector analysis.) USSR.

A generalized algorithm is derived for the optimal dual control strategy for an object with several inputs and outputs, having memory. An example of the application of this algorithm is given. Methods are examined for further development in the field of dual control theory. (Author)

AD-269 641 Div. 19, 12
(TISTP/WH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE ALMOST-PERIODIC REGIME OF A FOUR-DIMENSIONAL AUTOMATIC CONTROL SYSTEM,

by B. V. Shirokorad. 17 Aug 61, 17p. 11 refs. (Trans. no. MCL-1254/1 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk Energetika I Avtomatika 5:159-165, 1960)
Unclassified report

DESCRIPTORS: (*Control systems, Automatic, Synthesis, Differential equations, Toplogy.) (*Rocket trajectories, Matrix algebra, Inequalities, Mathematical analysis.) USSR.

Contents:
The starting regime of a dynamic continuous-time system
The Perron inequality
The canonical control system
The starting regime of the canonical system
Rocket equations
Autopilot equations
Horizontal veering stability
Starting regime of the rocket
The repulsivity of the coordinate origin
Separatrix surfaces of the phase portrait
The existence of a simple closed trajectory
The existence of an almost-periodic trajectory

AD-269 732 Div. 19, 12
(TISTW/RD) OTS price $6.60

Space Technology Labs., Inc., Los Angeles, Calif.
LOW RATE SENSING CAPABILITIES OF SINGLE-DEGREE-OF-FREEDOM GYROS.
Rept. on Study of Attitude Sensors for Space Missions,
by Carl Grubin. June 60, 55p. incl. illus. 9 refs. (Rept. no. STL/TN-60-0000-09141)
(Contract AF 04(647)309)
Unclassified report

DESCRIPTORS: (*Gyroscopes, Operation.) (Instrumentation for Stabilization of *Control systems during Space flight.)

A survey of the low rate sensing capabilities of in-production and developmental mechanical instruments is described. Mechanical rate instruments include primarily the single degree-of-freedom gyro, spring restrained and unheated, and electrically restrained, heated and unheated. Also discussed are two classes of vibratory gyros and the use of angular accelerometers. Two appendices analyze the effect of rate sensor dead-band on gas consumption, and the use of a low rate sensor to detect satellite yaw motion. It is concluded that: (1) The electrically restrained, heated gyro has the best over-all low rate sensing capabilities; (2) The spring restrained gyro has over-all performance qualities which should be adequate for many missions; (3) Integrating the output of an angular accelerometer appears to be a very promising prospect; and (4) Vibratory gyros are in the early stages of development and little is known about their actual performance. (Author)

AD-269 829 Div. 19, 1, 6
(TISTA/WAW) OTS price $9.60

Bell Aerosystems Co., Buffalo, N. Y.
AIRCRAFT LANDING SYSTEM COMPATIBILITY STUDY.
U-3A. AN/GSN-5.
Final engineering rept.
Sep 61, 109p. incl. illus. tables (Rept. no. 60003-044)
(Contract AF 33(616)6483)
Unclassified report

DESCRIPTORS: (*Liaison planes, Instrument landings, All-weather aviation, *Ground controlled approach radar, Servo systems, Control systems, Radar tracking, Radar equipment, Automatic pilots, Navigation computers, Stability, Errors, Design, Simulation by Analog computers, Digital computers.) Radar echo areas.

The Landing Control, Central, AN/GSN-5 is a ground-based, final approach navigation system providing three basic approach and landing techniques, namely, completely automatic control, cross-pointer guided approach, and talkdown. These techniques may be used singularly or in combination. In all cases, however, aircraft surveillance and guidance information are maintained to touchdown. The study of the compatibility of the U-3A aircraft, the L-2 autopilot, and the Landing Control, Central, AN/GSN-5 indicates that, with the airborne and ground units conforming to the performance requirements stated herein, the aircraft and the AN/GSN-5 system are compatible, and that satisfactory all weather automatic final approaches and landings can be made. The aircraft is also compatible with the AN/GSN-5 system for cross-pointer or talkdown guided approaches. (Author)

AD-269 872 Div. 19, 12
(TISTA/VGW) OTS price $1.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
VELOCITY REQUIREMENTS FOR TRANSFER BETWEEN CO-PLANAR, CO-AXIAL ORBITS,
by Eugene M. Romer. 5 Jan 62, 17p. incl. illus. 3 refs. (Technical rept. no. 62-1)
(Proj. AFIT 61-23)
Unclassified report

DESCRIPTORS: (Celestial mechanics, *Orbital flight paths, Satellites, Satellite vehicles, Thrust, Satellite vehicle trajectories, Velocity, Military requirements, Space flight, Mathematical analysis, Navigation computers.)

The total velocity requirements for coplanar, cotangential transfer between orbits with a common major diameter are examined. The results are valid for ascending, descending, intersecting, and non-intersecting orbits. Computational results obtained using the AFIT IBM 1620 computer are presented for elliptic, parabolic, and hyperbolic outer orbits as a function of the transfer and outer orbit geometries. For the parabolic outer orbit, the maximum velocity requirement is 18% greater than the escape velocity at the periapsis of the transfer orbit when the transfer orbit has an eccentricity of 0.73. For hyperbolic orbits, maximum velocity requirements occur at particular elliptical transfer orbits where the velocities at infinity (i.e., the hyperbolic excess), are less than one third the reference escape velocity. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-269 113 Div. 20, 12, 16
(TISTB/CCH) OTS price $2.60

Rand Corp., Santa Monica, Calif.
SOLAR-FLARE RADIATION AND MANNED SPACE FLIGHT,

by D. J. Dugas. Nov 61, 23p. incl. illus. tables, 32 refs. (Research memo. RM-2825-PR)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: (*Solar flares, *Space flight, Manned, *Radiation hazards, *Radiation injuries, Mathematical analysis.) (Dose rate, *Sunspots, Solar energy, Van Allen radiation belt, Cosmic rays.)

Solar-flare emission will be the determining factor in shield design for manned interplanetary vehicles. Present knowledge of solar-flare characteristics is insufficient to permit an accurate calculation of the radiation dosage to be expected in space. Flares occur at irregular intervals, making them difficult to forecast; furthermore, the intensity and duration vary from one event to another in an undefined manner. This memorandum summarizes the currently known facts about solar flares, illustrates some of the difficulties in accurately determining shield requirements, and points out the areas in which additional experimental data would be of greatest value. (Author)

AD-269 384 Div. 20, 4
(TISTM/TCG) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
LOW-ENERGY ELECTRON SCATTERING FROM ATOMIC OXYGEN,
by R. H. Neynaber, L. L. Marino and others.
Feb 61, 21p. incl. illus. 20 refs. (Rept. no. ZPh-091)
(Contract DA 04-495-ORD-3112)
Unclassified report

DESCRIPTORS: (*Electrons, *Attenuation from *Oxygen, Atoms, Electron guns, Electron beams, Molecular beams, Radiofrequency, Gas discharges, Dissociation, Ionization, Measurement, Mass spectroscopy.) (Scattering, Electrons.)

The total cross section for the scattering of electrons by atomic O was measured as a function of electron energy from 2.3 to 11.6 ev. The number of electrons scattered from a region defined by the intersection of an electron beam and a modulated molecular O beam was compared with the number scattered when the O beam was partially dissociated. A radio-frequency discharge dissociated about 30% of the molecules. The degree of dissociation was measured with a mass spectrometer. From the data, the ratios of atomic to molecular scattering cross sections were obtained. The absolute atomic values were calculated by multiplying these ratios by the molecular O cross sections obtained by Bruche (Ann. Physik 83:1065, 1957). The result is a virtually constant cross section of 6.2 ± $0.5\pi a_0^2$ in the entire energy range studied. These results are compared with 5 theoretical estimates. (Author)

AD-269 408 Div. 20, 25
(TISTP/MFA) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
ELECTRON IMPACT IONIZATION OF ATOMIC HYDROGEN AND ATOMIC OXYGEN,
by Erhard W. Rothe, Lawrence L. Marino and others. 15 Aug 61, 9p. incl. illus. 10 refs. (Rept. no. ZPh-113)
(Contract DA 04-495-ORD-3112)
Unclassified report

DESCRIPTORS: (*Ionization, Atoms, *Hydrogen, Oxygen, Molecular beams.) (Ionization chambers, Ions, Dissociation, Electron guns, Ionization potentials.) (Transport properties, Elastic scattering, Probability.) (Mass spectrometers, Experimental data.)

The total cross sections for the ionization of atomic oxygen and atomic hydrogen were measured by a modulated molecular beam technique. The impact energies were 100 to 500 ev for oxygen and 100 to 750 ev for hydrogen. The number of ions formed in a region defined by the intersection of an electron beam and a modulated molecular beam was compared with the number formed when the neutral beam was partially dissociated. All ions were collected, including those energetic ions formed in dissociative ionization. The degree of dissociation was measured with a mass spectrometer. The ratio of the atomic to the molecular ionization cross sections were obtained. Absolute atomic values were calculated by multiplying these ratios by molecular ionization cross sections. Results are compared with theoretical estimates and previous experimental determinations. (Author)

AD-269 576 Div. 20, 16
(TISTB/LH) OTS price $1.10

Michigan U., Ann Arbor.
STUDY OF THE EFFECTS OF BETA-RADIATION ON THE INTERMEDIARY METABOLISM OF MAMMALIAN SKIN.
Progress rept.,
by I. A. Bernstein. 31 Oct 60, 3p. 7 refs.
(Contract Nonr-122435, Proj. NR 105-223)
Unclassified report

DESCRIPTORS: (*Radiation effects, *Mammals, Laboratory animals, Sodium compounds, Phosphates, Skin, *Metabolism.) Biosynthesis, Tracer studies.

AD-269 823 Div. 20, 16
(TISTB/CCH) OTS price $1.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
METABOLISM OF RUTHENIUM IN THE RAT,
by Joseph E. Traynor and Sidlee W. Leeper.
Dec 61, 13p. incl. tables, 5 refs. (Rept. no. AFSWC-TDR-61-105)
(Proj. 7801) Unclassified report

DESCRIPTORS: (*Metabolism, *Ruthenium, *Fission products, Experimental data.) (Biochemical tests, Measurement, Isotopes, Absorption, Excretion, Omentum, Autoradiography.) *Radiobiology.

Seventeen Sprague-Dawley rats were injected intramuscularly and intraperitoneally with ruthenium-106. The amount of this isotope was determined daily for 5 weeks in the urine and feces. Animals were sacrificed at intervals and the various organs were analyzed for ruthenium. It was noted from this experiment that the pathways of absorption, metabolism, and excretion are dependent on the route of administration of ruthenium. (Author)

Division 21 - NUCLEAR PROPULSION
Division 22 - ORDNANCE

21. NUCLEAR PROPULSION

AD-269 257 Div. 21, 17
(TISTM/TCG) OTS price $6.10

Martin Co., Baltimore, Md.
ANPP CORROSION PROGRAM. LOOP TESTING OF INCONEL, NICKEL, MONEL AND BIMETAL HEAT EXCHANGERS,
by J. McGrew and E. Jules. Dec 61, 82p. incl. illus. tables, 9 refs. (Rept. no. MND-E-2681)
(Contract DA 44-009-eng-3581)
Unclassified report

DESCRIPTORS: (*Nuclear propulsion, *Heat exchangers, Steam, Generators, Metals, Pipes, Production, Processing, Model tests, Test methods, Design.) (*Corrosion, Erosion, Pickling, Deterioration, Crazing.) (Stainless steel, *Steel, *Nickel alloys, *Chromium alloys, *Nickel.) (Feed water with Chlorides, Sodium compounds, Hydroxides, Phosphates.)

Corrosion tests were performed on 12 test vessels. Two sets of model heat exchangers (a set consists of a steam generator and superheater) and eight miniature heat exchangers were tested dynamically in a pressurized water loop. One set of model heat exchangers had bimetal tubes (stainless steel in the primary, carbon steel in the secondary) and the other had Inconel tubes. The set with bimetal tubes was service tested for 4890 and that with Inconel tubes was service tested 4747 hr. The secondary environment in the bimetal vessels simulated the SM-1 water conditions while the secondary in the Inconel vessels simulated reactor quality water. The Inconel, nickel and Monel tubing performed well in both reactor grade and high chloride secondary water. The Inconel tubing in the model vessels exposed to reactor grade water did not pit. The bimetal model vessels which were tested using reactor grade water showed the degree of pitting was prohibitive for long-life steam generators. Tubing in one of the bimetal miniature vessels was defected to expose stainless steel to the high chloride secondary environment; no cracking of the stainless sublayer occurred. (Author)

AD-269 792 Div. 21, 30
(TISTA/SEB) OTS price $1.60

Aerospace Information Div., Washington, D. C.
SOVIET NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
Monthly rept. no. 9, 10 Sep-10 Nov 61.
11 Dec 61, 15p. incl. illus. 7 refs. (AID rept. 61-152)
Unclassified report

DESCRIPTORS: (*Gamma counters, *Scintillation counters, Design.) (Gas flow, Measurement, *Flowmeters, Design.) (*Heterogeneous reactors, Nuclear reactions, Reactor reactivity, Critical assemblies, Reactor theory.) (Nuclear power plants, *Fuel elements, Radioactive waste.) (Low pressure research, *Pneumatic servomechanisms, Automatic, Control systems, Design.) (*Liquid metals, Heat transfer, Turbulent flow, Fluid flow in Pipes.)

Contents:
Differential method for determining the efficiency of a gamma counter
Pneumatic integrator with aperiodic unit throttle operating in the low-pressure range
Fast neutron scintillation counter with low sensitivity to gamma background
New principle for measuring gas flow
Experimental study of the effects of interaction between two subcritical reactors (Investigation of the critical parameters of reactor systems; collection of articles)
Investigation of the spent fuel elements of the First Nuclear Power Plant
Heat transfer in turbulent flow of liquid metals in pipes

22. ORDNANCE

AD-269 029 Div. 22
(TISTW/JRG) OTS price $1.10

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND MANUFACTURE OF SPECIAL CALIBER .30 ELECTRIC PRIMERS.
Monthly progress rept. no. 5, 1 Sep-31 Oct 61,
by Theodore B. Johnson. 9 Nov 61, 3p. table.
(Contract DA 19-020-ORD-5379, Proj. TN1-2707)
Unclassified report

DESCRIPTORS: (*Electric primers, Electrodes, Switches, Primers, Mixtures, Conductivity, Reliability, Tests, Test equipment.) Explosive actuators.

A new fixture for holding and firing the switch was made. Primers with approximately 0.27 grains of XP-407 mixture were produced and tested in T2 switches with the new fixture. There were no failures to break the switch foil and no disruption of parts of the switch and electrode assemblies. As a result of these tests, a 30-hole laboratory charger plate was fabricated for charging larger quantities of primers at approximately 0.27 grains for reliability tests in T2 switches. (Author)

AD-269 037 Div. 22
(TISTW/RD) OTS price $3.60

General Technology Corp., Elgin, Ill.
RESEARCH AND DEVELOPMENT STUDY ON STRESS-STRAIN CHARACTERISTICS OF SHELLS AND HIGH EXPLOSIVES.
Summary rept.,
by R. C. Geldmacker and A. C. Eringen. July 61, 37p. incl. illus. tables, 5 refs. (Technical rept. no. 1-19)
(Contract DA 11-022-ORD-2917, Proj. no. TA2-8051)
Unclassified report

Original contains color plates; All ASTIA reproductions will be in Black and White. Original may be seen in ASTIA Hq.

DESCRIPTORS: (*Projectiles, Design, Rotating bands, Explosives, *Stresses, Deformation, Elasticity, Plasticity.)

A complete experimental and theoretical elastic analysis has been made of the flat base shell and a procedure for programming the analysis on a digital computer has been provided. Excellent progress was made on three principal remaining problems, namely: the behavior of filler materials, the interaction between filler and shell, and yielding of the shell in the vicinity of the rotating band. (Author)

AD-269 058 Div. 22
(TISTW/JRG) OTS price $7.60

Lake City Arsenal, Independence, Mo.
STUDY OF THE WELDED ROTATING BAND FOR 20MM AIRCRAFT AMMUNITION,
by Frank W. Littleford. Aug 61, 69p. incl. illus. 7 refs. (IED rept. no. 61-13)
(Proj. OAC 56-240)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (*Aircraft ammunition, High explosive ammunition, Incendiary ammunition, Projectiles, *Rotating bands, Welds, Design, Tests, Metallurgical analysis.) (Aircraft guns, Automatic weapons, Gun barrels, Erosion.) Switzerland.

A study was conducted to determine causes for the low barrel life with overlay welded rotating bands on 60/20mm aircraft ammunition. Extensive metallurgical data were compiled on all test items to aid in the evaluation of test results, and to assure recognition of pertinent welded band parameters. Test results confirmed existing principles that fringing can be alleviated or eliminated by the design of the band itself; and that the iron content of the band is affected by temperature of application and has no appreciable effect on barrel life. (Author)

AD-269 059 Div. 22
(TISTW/JRG) OTS price $2.60

Lake City Arsenal, Independence, Mo.
ENGINEERING FOR PRODUCTION OF CARTRIDGE, 20MM, HPT, M54E2,
by Frank W. Littleford. Oct 61, 20p. incl. illus. (IED rept. no. 61-15)
(OAC Proj. 57-49)
Unclassified report

DESCRIPTORS: (*Aircraft ammunition, Design, Tests, Costs.) (Ammunition, Pressure, Tests, Gun barrels, Guns, Aircraft guns, Automatic weapons.)

Feeding and ramming difficulties during short burst automatic fire with the cartridge, 20mm, HPT, M54 were traced to the external configuration of the projectile nose, a redesign being indicated. The T46 and T51 projectiles were developed which proved to be satisfactory in limited tests. The T46 closely followed standard (M55) Projectile design, but the T51 was completely unconventional, being of one-piece construction and having a distinctive dumbbell shape. A cost study indicated the T51 design to be the more economical to manufacture and its unusual shape made it inherently identifiable. The one-piece construction also eliminated nose assembly difficulties and security problems during feeding and ramming. Minor design and dimensional changes were made to the T51 projectile to promote volume production, and it was designated the M54E2. It is recommended that the cartridge, 20mm, HPT, M54E2 be standardized as the cartridge, 20mm, HPT, M54A1 for procurement where high pressure test ammunition is required for use in 20mm aircraft weapons. (Author)

AD-269 090 Div. 22
(TISTW/JRG) OTS price $1.25

Naval Ordnance Lab., White Oak, Md.
THE CHARACTERISTICS OF ELECTRIC SPARK DISCHARGES IN MIXTURES OF HIGH-EXPLOSIVE AND ALUMINUM POWDERS,
by T. P. Liddiard, Jr. 25 Aug 61, 36p. incl. illus. tables, 9 refs. (Rept. no. NOLTR 61-67)
Unclassified report

DESCRIPTORS: (*Explosives, *Aluminized explosives, Aluminum, Powder metals, RDX, Carbohydrates, *Sparks, *Electric discharges.) (Sparks, Electric discharges, Circuits, Tests, Resistance, Measurement.) (Explosives, Detonation.)

A method is described for obtaining the average resistance of a spark discharging through a granular conductive mix in a non-oscillating discharge system. The spark resistance is a linear function of the spark gap width for a given electrode arrangement. The resistance is relatively independent of the density of the mix over the range 0.7 to 0.9 ohm. (Author)

AD-269 111 Div. 22
(TISTW/RD) OTS price $8.10

Rock Island Arsenal, Ill.
LAUNCHER, ROCKET, 318 MM, XM34E1.
Notes on Development Type Materiel.
Dec 61, 79p. incl. illus. tables.
(DA proj. no. 517-07-035)
Unclassified report

DESCRIPTORS: *Rocket launchers, Artillery rockets.

AD-269 148 Div. 22, 14, 4, 25, 9
(TISTA/SEB) OTS price $8.10

Army Rocket and Guided Missile Agency, Huntsville, Ala.
QUARTERLY RESEARCH REVIEW NO. 30, 1 MAY-31 JULY 61.
1 Nov 61, 80p. incl. illus. tables, 36 refs.
(Rept. no. ARGMA TN 2H1N-30)
Unclassified report

DESCRIPTORS: (Reinforcing materials, Glass textiles, *Phenolic resins, Mechanical properties.) (*Boron, Preparation, Purification.) (Nuclear physics, *Radioactive decay.) (Ethylene, Nitrogen compounds, Fluorides, Combustion.) (Electronics, Atmospherics, *Noise analyzers, Theory.) (Gases, *Magnetohydrodynamics, Plasma physics, Plasma jets, High temperature research.) (*Hypersonic wind tunnels, Hypersonics, Re-entry aerodynamics, Aerodynamic heating, Simulation.) (Solid state physics, Electrons, Transport properties.)

Division 22 - ORDNANCE

Contents: MATERIALS (Mechanics of materials and structures and preparation of high purity boron); NUCLEAR PHYSICS (Isomeric yields from (n, 2n) reactions); FUELS AND COMBUSTION (Burning rates of ethylene-NF3); PHYSICAL ELECTRONICS (Spectrum of amplitude-modulated noise after square-law detection II); HIGH TEMPERATURE PHYSICS (Simplified probe theory III, Plasma jet in probe measurements, Analysis of probe data by simplified double probe theory, Graphs for the truncation of partition functions of selected elements, Control system for the hyperthermal test facility, and Electron capture in a magnetic field); and SOLID STATE PHYSICS (Transport of fast electrons).

AD-269 256 Div. 22
(TISTW/JRG) OTS price $1.60

Miller Research Labs., Baltimore, Md.
PRODUCTION ENGINEERING OF PLASTIC COMPONENTS FOR CARTRIDGE, 81mm, ILLUMINATING, T214E2.
Monthly progress rept. no. 5, 1-30 Nov 61, by E. R. Briggeman. 11 Dec 61, 19p. (Rept. no. 251-5)
(Contract DA 36-034-ORD-3468)
Unclassified report

DESCRIPTORS: (*Illuminating projectiles, *Cartridges, Rocket assisted projectiles, Plastics, Production, Manufacturing methods.) (Rocket motors, Propellants, Specific impulse.)

AD-269 574 Div. 22
(TISTW/DLW) OTS price $1.10

Measurement Systems, Inc., Norwalk, Conn.
QUANTUM DETECTOR FOR MEASUREMENT OF EED BRIDGE WIRE TEMPERATURE RISE.
Monthly progress rept. no. 6, 1-31 Dec 61, 1 Jan 62, 4p. incl. illus. (Rept. no. ER-7032)
(Contract N178-7934)
Unclassified report

DESCRIPTORS: (*Electric detonators, *Electric igniters, Electric bridges, Temperature, Electromagnetic effects, Electric wire, Hazards, Detectors, Optical equipment, *Temperature warning systems, Design, Sensitivity, Tests.)

The construction and testing of an experimental model squib quantum detector is discussed. A second experimental model was also started. In this model, the mirror and the detector was left uncemented so that alignment could be made by electrical means. Certain design changes were also made. Two holes were drilled through the squib plug and the Microdot shielded cables were cemented into these holes. The electrical connections from the detector and the vibrator coil could be made with fine wires soldered to the Microdot cable, which was rigidly cemented into the plug. (Author)

AD-269 686 Div. 22
(TISTW/JRG) OTS price $2.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
PRODUCTION ENGINEERING STUDY OF THE T28E2 CLUSTER, BOMB, FRAGMENTATION,
by Neil J. McClymont. Aug 61, 42p. incl. illus. tables (Technical rept. no. DC-TR-6-60)
Unclassified report

DESCRIPTORS: (*Bombs, *Fragmentation ammunition, *Bomb clusters, Bomb fuzes, Costs, Design, Production.)

In this study, no attempt was made to improve the military characteristics nor to attempt a major redesign of the fragmentation bomb cluster. The effort was concentrated in product improvement, cost reduction, and the preparation of a description of manufacture. The M38 (T28E2) cluster consists of: (a) an M32 (T39E2) cluster adapter equipped with an M144 (T172) fin assembly with a mechanical time fuze AN-M146A1 or M198 and an M31 (T39) arming wire assembly; and (b) twenty-four clustered M128 (T17E2) 20-lb fragmentation bombs arranged in 2 tiers, with extensible boom M145) tail assemblies on the bombs in the forward tier and fixed boom (M146) tail assemblies on the bombs in the aft tier. (Author)

AD-269 769 Div. 22, 17
(TISTW/JRG) OTS price $4.60

Institute of Metals and Explosives Research, U. of Utah, Salt Lake City.
INVESTIGATION OF HIGH VELOCITY IMPACT AND SOME HIGH EXPLOSIVES PHENOMENA.
Final rept. 1 July 55-30 Sep 61, by R. T. Keyes. 1 Dec 61, 44p. incl. illus. tables, 10 refs.
(Contract AF 18(603)100)
Unclassified report

DESCRIPTORS: (*Hypervelocity projectiles, *Particles, *Cratering, Ionization, Impact shock, Shaped charges, Penetration, *Explosives, *Detonation, Explosions, Gases, Electrons, Density, Electrical properties, Electromagnetic properties, Pressure, Plasma jets, Plasma physics.) (Metals, Penetration.)

A summary of the important results obtained in this research is given. The subject matter included: (1) high explosive generators for fast particles; (2) mechanism of cratering in ultra high velocity impact; (3) observations of vaporization accompanying ultra high velocity impact; (4) mechanism for crater expansion in shaped charge penetration; (5) ionization and electron densities in detonating solid explosives; (6) electrical fields and electromagnetic radiation from chemical detonations; (7) external detonation generated plasmas; (8) the effect of pressure on the degree of ionization in gaseous detonations; (9) ionization and electrical conductivity and its relationship to the deflagration to detonation transition in solid explosives; and (10) transition to detonation in liquid explosives. (Author)

AD-269 802 Div. 22, 30
(TISTP/TL) OTS price $9.10

Ordnance Tank-Automotive Command, Detroit, Mich.
XM104 SUSPENSION STUDY,
by Charles T. Rogers and Sam F. Heal. July 61, 96p. incl. illus. tables, 3 refs. (Rept. no. RR-41)
(DA Proj. no. 545-03-030)
Unclassified report

DESCRIPTORS: (*Tracked vehicles, *Tanks, Suspension bands, Springs, Stability, Analysis, Dynamics, Simulation, Tests.) (Shock waves, Absorption, Velocity, Pitch, Acceleration, Damping, Moment, Gravity.) (Test equipment, Analog computers, Digital computers, Analog to digital connectors.) Differential equations.

The results of a comparative study of two suspension systems considered for use in the XM104 tracked vehicle are presented in complete detail. Simulation tests were conducted over a modified sine wave at speeds of 5, 10, 15, 20 and 30 miles per hour. (Author)

AD-269 820 Div. 22
(TISTW/JRG) OTS price $8.10

Aeronautical Radio, Inc., Washington, D. C.
RELIABILITY PREDICTION AND ASSURANCE IN NAVAL ORDNANCE WEAPONS SYSTEMS.
Final rept.,
by N. E. McAdory and Lewis E. Williamson.
29 Sep 61, 86p. incl. illus. 16 refs. (Publication no. 108-1-265)
(Contract NOrd-18452)
Unclassified report

DESCRIPTORS: (*Reliability, Mathematical prediction, Standards, Shipborne, Fire control, *Radar equipment, Fire control computers, Airborne, Search radar.) (Shipborne, Electronic equipment, Failure (Mechanics).) Naval ordnance.

A summary is given concerning the development of a proposed military standard on reliability prediction for naval weapons systems, and accompanying reporting procedures. The following 3-phase program was formulated to attain the objective: (1) Previously developed reliability prediction procedures were applied to selected Bureau of Naval Weapons systems, and the results were assessed by a comparison with previously measured reliabilities. (2) The prediction procedures used in phase 1 were refined in accordance with the results obtained therefrom, and these refined prediction procedures were arranged in a military standard format. (3) An educational and indoctrinational program on the application of the proposed military standard was prepared. (Author)

AD-269 832 Div. 22, 15
(TISTP/MFA) OTS price $1.10

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TABLES OF CYLINDRICAL BLAST FUNCTIONS FOR GAMMA EQUALS 5/3 AND GAMMA EQUALS 7/5,
by Nathan Gerber and Joan M. Bartos. Oct 61, 16p. incl. tables, 3 refs. (BRL memo. rept. no. 1376)
(DA Proj. no. 503-03-001)
Unclassified report

DESCRIPTORS: (Shock waves, *Blast, Cylindrical bodies, Gas flow, *Functions, *Tables.) (Numerical analysis, Differential equations.) (Wire, Detonation, Shock waves, Blast.) Specific heat.

Tables of similarity functions defining the flow field behind expanding cylindrical shock waves are presented here for values of 5/3 and values of 7/5. A brief discussion includes the differential equations and boundary conditions for these functions together with an analytical solution for them. (Author)

23. PERSONNEL AND TRAINING

AD-269 670 Div. 23
(TISTB/MS) OTS price $8.10

Ohio State U. Research Foundation, Columbus.
GENERAL ON-THE-JOB CRITERIA OF AIRMAN EFFECTIVENESS APPLIED TO THREE CAREER FIELDS,
by Robert J. Wherry, and Norman Stander and others. June 61, 84p. incl. illus. tables, 7 refs.
(Contract AF 41(657)270, Proj. 7717)
(ASD TR 61-98) Unclassified report

DESCRIPTORS: (*Job analysis, Standards, Aviation personnel, Effectiveness.) *Factor analysis.

Three criterion measures were constructed and administered at two Air Force bases to airmen selected from three career areas which correspond to three aptitude groups defined by Air Force classification tests. Each of the three instruments was subjected to a factor analysis; the resulting factor scores, in combination with test scores and operationally derived performance ratings, were also factor analyzed. Six factors were identified, with each factor defined by at least two of the major variables. Short forms of two of the criterion instruments were prepared for further use. The results suggest suitability of these scales across the three job areas. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-269 847 Div. 24
(TISTA/VGW) OTS price $1.60

Fairchild Camera and Instrument Corp., Syosset, N. Y.
F-415A CAMERA SYSTEM.
Progress rept. no. 1.
1961, 18p. incl. illus.
(Contract AF 33(657)7759)
Unclassified report

DESCRIPTORS: (*Wide field cameras, *Aerial cameras, Prisms (Optics), Panoramic scanners for Aerial reconnaissance, Design, Effectiveness.)

A description is given of the F-415A rotary prism panoramic camera. The F-415A has been optimized for achieving photographic coverage, horizon to horizon, of an area while operating at a minimum of 500 feet above the terrain at an airspeed of 600 knots. The stereo viewing capability is maintained by obtaining a sixty percent overlap of succeeding frames of photography. The F-415A has, as a design objective, a dynamic resolution of 20 lines per millimeter. (Author)

25. PHYSICS

AD-269 000 Div. 25
(TISTM/GEC) OTS price $3.60

AeroChem Research Labs., Inc., Princeton, N. J.
PRELIMINARY OBSERVATIONS ON THE EFFUSION COOLING OF CATALYTIC SOLIDS EXPOSED TO PARTIALLY DISSOCIATED NONEQUILIBRIUM GAS STREAMS,
by Daniel E. Rosner. Oct 61, 28p. incl. illus. tables, 32 refs. (AeroChem TN-37)
(Contract AF 49(638)300)
(AFOSR-1841) Unclassified report

DESCRIPTORS: (*Solids, Catalysts, *Film cooling, *Gases, Pressure, Turbulent boundary layer, Thermal diffusion, Transport properties, Heat of formation, Chemical reactions, Reaction kinetics, Thermochemistry.) (Coolants, Nitrogen, Ethylenes, Ammonia, Nitrogen compounds, Oxides.) Electric discharges.

The consequences of gas phase chemical reaction between an effusion coolant and chemically reactive species present in the free stream are discussed with regard to convective energy transfer to catalytically active solids. A porous Cu surface was exposed to a supersonic stream of activated N. The relative effectiveness of ethylene, NH3, N, and NO2 as coolants was markedly altered by the effects of specificity in their gas phase chemical behavior. This suggested that differences in gas phase chemical reactivity could be used in selecting effusion coolants for catalytically active solids exposed to high temperature partially dissociated streams. (Author)

AD-269 007 Div. 25
(TISTM/TCG) OTS price $2.60

Cornell U., Ithaca, N. Y.
CARRIER CHARACTERISTICS IN COPPER-DOPED WO3 FROM CONDUCTIVITY, HALL VOLTAGE, AND THERMAL E.M.F. STUDIES,
by M. J. Sienko and Paul F. Weller. 1961, 25p. incl. illus, tables, 23 refs.
(AFOSR-1705) Unclassified report

DESCRIPTORS: (*Semiconductors, *Tungsten compounds, Oxides with Copper, Chemical impurities, Metallic compounds, Single crystals, Preparation, Electrolysis and Temperature, Decomposition, Synthesis.) (Crystal structure, Lattices, Resistance, Hall effect, Thermoelectricity, Conductivity, Electric potential, Measurement.) (Electron transitions, Excitation, Ferroelectricity, Theory, Density.)

Single crystals of Cuo.076WO3, Cuo.094WO3, and Cuo.95WO3+delta were prepared by thermal decomposition of CuWO4 and WO3. Potential-probe resistivity measurements in the range 120 to 770 K indicate complex semiconducting behavior. Cuo.076WO3 and Cuo.094WO3, which are orthorhombic, show 3 linear segments in the log rho vs. 1/T dependence, the apparent activation energies being 0.05 ev below 170 K, 0.4 ev between 170 and 220 K, and 0.45 ev above 500 K. Between 220 and 500 K, behavior is metallic. Cuo.95WO3+delta, which is triclinic, shows no metallic region but has 2 linear segments with activation energy 0.10 ev below 700 K and 0.15 ev above. Measurements of the Hall voltage and of the thermoelectric power indicate that carriers are electrons. At 300 K, carrier densities are 4.9 x 10 to the 18th power, and 0.90 x 10 to the 18th power electrons/cc with mobilities 5.9, 10, and 0.37 sq cm/volt-sec. for Cuo.076WO3, Cuo.094WO3, and Cuo.95WO3+delta, respectively. Thermal emf's fall in the range -220 to -300 microvolts/degree C. (Author)

AD-269 051 Div. 25
(TISTP/MFA) OTS price $2.60

Coordinated Science Lab., U. of Illinois, Urbana.
THE ELECTROSTATIC INSTABILITY OF A BEAM OF CHARGED PARTICLES PENETRATING A PLASMA,
by G. Ascoli. Dec 61, 30p. (Rept. no. R-131)
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: (*Particle beams, Electron beams, Particles, Stability, Electromagnetic waves, Electrostatics, Transport properties, *Plasma physics, Plasma oscillations, Penetration, Magnetic fields, Dielectrics.) (Perturbation theory, Integral equations, Matrix algebra.)

The stability of an infinite beam of charged particles penetrating a plasma against small amplitude electrostatic perturbations is investigated. In Section A the dispersion relation is derived, taking into account the velocity distribution of the beam particles. In Section B it is shown that in the presence of collisions the electrostatic instabilities can be quenched if the beam particles have a velocity spread. In Section C the results are applied to a beam of finite cross section held together by its own magnetic field. The criteria for the stability of such a beam against electrostatic perturbations is derived. (Author)

AD-269 073 Div. 25
(TISTP/TL) OTS price $5.60

National Magnet Lab., Mass. Inst. of Tech., Cambridge.
SOME USEFUL INFORMATION FOR THE DESIGN OF AIR-CORE SOLENOIDS, PART I. RELATIONSHIPS BETWEEN MAGNETIC FIELD, POWER, AMPERE-TURNS AND CURRENT DENSITY. PART II. HOMOGENEOUS MAGNETIC FIELDS,
by D. Bruce Montgomery and J. Terrell. Nov 61, 1v. incl. illus. tables.
(Contract AF 19(604)7344)
(AFOSR-1525) Unclassified report

DESCRIPTORS: (*Coils, Geometry, Air, Magnetic cores, *Solenoids, Design.) (Power, Magnetic fields, Electric currents, Density.) (Taylor's series, Polynomials, Matrix algebra, Algebra, Integrals.) Tables.

Relationships relating power, magnetic field, current density, and ampere-turns in terms of certain dimensionless factors are summarized for many types of coil geometries and current distributions. A number of plots of these factors are presented. The field homogeneity in magnet structures is presented in terms of a series expansion about the origin utilizing Legendre Polynomials. A number of tables to facilitate design of homogeneous fields are presented. A method of achieving homogeneity in long solenoid structures by the use of determinants is discussed. Expressions for the axial field from uniform and radially varying current density coils are given. (Author)

AD-269 074 Div. 25
(TISTP/TL) OTS price $3.60

National Magnet Lab., Mass. Inst. of Tech., Cambridge.
SOME USEFUL INFORMATION FOR THE DESIGN OF IRON MAGNETS. PART I. THE CALCULATION OF GAP FIELDS BY MEANS OF EQUIVALENT SURFACE POLES. PART II. THE CALCULATION OF GAP FIELDS BY MEANS OF DISTRIBUTED VOLUME DIPOLES. PART III. ANALYSIS OF EXISTING MAGNETS,
by D. Bruce Montgomery. Nov 61, 38p. incl. illus. tables, 1 ref.
(Contract AF 19(604)7344)
(AFOSR-1526) Unclassified report

DESCRIPTORS: (*Iron, *Magnets, Design.) (*Magnetic fields, Measurement, Magnet coils, Separation, Mathematical analysis, Taylor's series, Integrals.) Analysis.

The calculation of gap fields in iron magnets by means of equivalent surface poles has been explored by several authors. This work is enlarged and the results compared with the performance of a wide range of commercial magnets. Magnet circuits can also be analyzed by a volume integral of dipoles. This removes the restriction of uniform magnetization and allows the optimum direction of magnetization to be explored. General results are given for iron cylinders, and a number of specific tapered poles are analyzed. The homogeneity of fields in the gaps of magnets is presented in the form of a Taylor series of error coefficients. (Author)

AD-269 081 Div. 25, 4
(TISTM/GEC) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
THERMODYNAMIC PROPERTIES OF POLYETHYLENE,
by R. W. Warfield and M. C. Petree. 3 Aug 61, 15p. incl. illus. tables, 18 refs. (Rept. no. NOLTR 61-92)
Unclassified report

DESCRIPTORS: (*Polymers, *Ethylenes, *Thermodynamics, Specific heat, Entropy, Enthalpy, Transition temperature, Theory.)

The lack of fundamental data on the properties of polyethylene prompted a study of the available thermodynamic parameters of this material From published data the entropy, enthalpy, and Gibbs free energy values of conventional high pressure polyethylene were calculated over the range 0 to 315 K. The use of a linear Tarassov function to estimate the specific heat of polyethylene is discussed. The thermodynamic function, Cp/T versus T, has been calculated and exhibits an increase at 60 K. An approximation is made of the number of vibrating units per repeating unit at 273 K. Cp-Cv is calculated at 273 K and found to be 0.082 cal/deg gm. (Author)

AD-269 088 Div. 25, 2
(TISTP/MFA) OTS price $.50

Naval Research Lab., Washington, D. C.
ACOUSTIC SPIN-WAVE BRANCHES OF A CLASS OF FERRIMAGNETS.
Final rept.,
by J. B. Langworthy. 12 Dec 61, 7p. incl. illus. tables, 7 refs. (NRL rept. no. 5708)
Unclassified report

DESCRIPTORS: (Crystals, Deformation, Ferrites, *Ferromagnetic materials, Magnetite, Garnet, *Crystal structure, Magnetic effects, Magnetic properties.) (*Acoustics, Energy, Wave transmission, Spin.) (Data, Tables.)

A simple new method of calculating the energies of long wavelength acoustic magnons in exchange-coupled solids, which have a unique acoustic spin-wave branch and which satisy certain explicit restrictions as to spin ordering and crystal symmetry, is exhibited for cases of yttrium iron garnet and magnetite. This method is based on a recent extension of the Holstein-Primakoff spin-wave theory to complex magnetic structures. Agreement with calculations is obtained. (Author)

AD-269 095 Div. 25, 17
(TISTM/TCG) OTS price $1.10

Ordnance Materials Research Office, Watertown, Mass.
NUCLEAR MAGNETIC RESONANCE IN METALLIC SINGLE CRYSTALS,
by Paul L. Sagalyn and J. Anton Hofmann. Dec 61, 8p. incl. illus. 5 refs. (MRL rept. no. 111)
(DA proj. 5-93-32-001, Proj. TB-4-001)
Unclassified report

DESCRIPTORS: (*Metallic crystals, *Single crystals, *Metals, *Alloys, Crystals, *Nuclear magnetic resonance, Hysteresis, Test methods.)

A method for observing nuclear resonance absorption in metallic single crystals is reported. The thick-sample method described appears to be applicable to a wide variety of pure metals and alloys, in single crystal or polycrystalline form. In cases where the signal to noise ratio is unfavorable, simple geometry applications are not adequate. However, the total surface of the sample can be increased by cutting slots in the crystal or by stacking several thick crystals. Anisotropic effects in single crystals of non-cubic metals will be of particular interest. Pure quadrupole resonance and relaxation time measurements on single metallic crystals should also be possible. (Author)

AD-269 096 Div. 25, 17
(TISTM/TCG) OTS price $1.10

Ordnance Materials Research Office, Watertown, Mass.
NUCLEAR MAGNETIC RESONANCE IN ALUMINUM AND COPPER SINGLE CRYSTALS,
by J. Anton Hofmann and Paul L. Sagalyn. Dec 61, 5p. incl. illus. table (MRL rept. no. 112)
(DA proj. 5-93-32-001; proj. TB 4-001))
Unclassified report

DESCRIPTORS: (Metallic crystals, Metals, *Aluminum, *Copper, Single crystals, *Nuclear magnetic resonance, Absorption, Magnetic moments, Measurement, Spectrophotometers, Test methods, Crystal structure.)

Nuclear magnetic resonance in single crystals of Al and Cu was observed by the thick-sample technique. It is suggested that the data reported are the first published results on nuclear resonance absorption in metallic single crystals. The absorption spectra for the fixed magnetic field parallel to the [001], [111], and [110] directions were determined. (Author)

AD-269 108 Div. 25, 8
(TISTM/TCG) OTS price $1.60

Ronson Metals Corp., Newark, N. J.
MATERIALS FOR AND THE MECHANISM OF GETTERING MULTIPLE COMPONENT GASES.
Scientific rept. no. 2, 8 June-8 Sep 61,
by E. I. Doucette. 13 Oct 61, 18p.
(Contract AF 19(604)8430)
(AFCRL-958) Unclassified report

DESCRIPTORS: (*Electron tubes, Metals, Surfaces, *Degasification, *Gas diffusion, *Gases, Chemical reactions, Reaction kinetics, Gas ionization, Pressure, Theory.) (Mass spectroscopy, Mass spectrometers, Vacuum apparatus, Design.) Materials.

A suitable vacuum system was constructed in conjunction with an omegatron mass spectrometer which is driven by an automatic recycling oscillator. The original system was modified to exclude flanges; a vacuum in the 10 to the -7th power was maintained. A relationship was established connecting the rate equation based on diffusion limited processes and the surface reactions based upon the mechanisms and reactions which take place at the getter surface. The partition coefficient was the factor most influential in the gettering process and methods of evaluating the partition coefficient of gases in the presence of other gases is considered for future examination. (Author)

AD-269 112 Div. 25
(TISTM/TCG) OTS price $6.60

RIAS, Inc., Baltimore, Md.
THE PROPERTIES OF CONDUCTION ELECTRONS IN ALKALI HALIDE CRYSTALS. II. A HARMONIC ANALYSIS OF THE ALTERNATING CURRENT SOLUTIONS OF THE EQUATION FOR MOTION OF MOBILE NEGATIVE CHARGE CARRIERS IN ADDITIVELY COLORED ALKALI HALIDE CRYSTALS,
by Larry Haines and David Kahn. Nov 61, 25p. tables (Technical rept. no. 61-16)
(Contract AF 49(638)1017)
(AFOSR-1752) Unclassified report

DESCRIPTORS: (*Semiconductors, Electrons, *Conductivity, *Alkali metal compounds, Halides, Crystals.) (*Harmonic analysis, Alternating current, Equations, Motion for Space charges, Electron charge, Diffusion, Density in *Potassium compounds, *Bromides, Color centers, Linear programming.) Solid state physics.

The equations of motion for space charge limited carrier diffusion in a trap free crystal are discussed. Boundary conditions equivalent to current blocking electrodes are introduced and only the negative charge carrier is assumed mobile. A sinusoidal voltage is applied to the crystal electrodes at ± L/2, where L is the crystal length. A general expression for the qth harmonic of the space average current and the negative charge carrier concentration at the electrode is given. It is shown that for a sinusoidal applied voltage and current blocking electrodes, the field and carrier concentrations have a definite parity which alternates with the order of the harmonic, and the even harmonics of the space average current are zero. Numerical solutions of the current and negative charge carrier concentration at the electrodes show that the harmonic content at low frequencies (less than 100 cps) is very large for an applied voltage greater than kT/e. At frequencies above approximately 100 cps, the so-called small signal linearized theory is applicable. (Author)

AD-269 119 Div. 25, 15
(TISTP/TL) OTS price $2.60

Syracuse U. Coll. of Engineering, N. Y.
ELEMENTARY DERIVATION OF WAVE SHAPE AND COHERENCE PROPERTIES OF NATURAL LIGHT USING THE TOOLS OF COMMUNICATION THEORY,
by Stanford Goldman. 15 Nov 61, 20p. incl. illus.
(Rept. no. EE494-6111TR-6)
(Contract Nonr-66910)
Unclassified report

DESCRIPTORS: (*Light, Communications theory, Light pulses, *Information theory, Optics.) (Time, Sampling, Polarization, Modulation, Noise, Theory.) (Atoms, Gases, Molecules, Spectrographic analysis, Amplitude modulation, Monochromatic light.) (Frequency, Interference, Diffraction, Masers.) (Statistical functions, Complex variables, Geometry, Fouriers analysis, Integral transforms, Statistical functions, Complex variables, *Harmonic analysis.)

Contents:
The superposition theorem of harmonic vibrations
The sampling theorem in the time domain
Representation of a signal of narrow line width
Wave shape of natural light
Some properties of polarization
Waveshape characteristics of a double line
The nature of coherence

AD-269 143 Div. 25
(TISTM/GEC) OTS price $2.60

Brown U., Providence, R. I.
STABILITY CRITERIA FOR ISOTROPIC LINEAR VISCOELASTIC MATERIALS,
by Boa-Teh Chu. Nov 61, 21p. 5 refs. (Technical rept. no. 26)
(Contract Nonr-56220)
Unclassified report

DESCRIPTORS: (*Elasticity, Viscosity, Materials, Stability, Theory.) (Mathematical analysis, Stresses, Tensile properties, Relaxation time.)

Stability criteria for an isotropic linear viscoelastic material are derived. It was shown that a material whose relaxation moduli satisfy Onat-Breuer's conditions of uniqueness also satisfy the requirement of stability. The relation between stability and uniqueness in cases where the inertia term in the equation of motion could not be neglected was also exhibited. (Author)

AD-269 158 Div. 25
(TISTP/WH) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
NEWS OF THE USSR ACADEMY OF SCIENCES, OFFICE OF TECHNICAL SCIENCES, MECHANICS AND MACHINE BUILDING (SELECTED ARTICLES).
19 Dec 61, 18p. incl. illus. table, 11 refs.
(Trans. no. FTD-TT-61-136 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye 6:pp. 86-90, 137-138-166-168, 1960)
Unclassified report

DESCRIPTORS: (Mathematical analysis, *Structures, Stresses.) (Steel, *Structural shells.) USSR.

Contents:
Bending of nonlinearly elastic three-ply plates
Comments on the creep of steel EI 257 under a complex stressed state
The stressed state in a cylindrical shell with a reinforced hole

AD-269 163 Div. 25
(TISTP/TL) OTS price $9.60

Warner and Swasey Co., Flushing, L. I. N. Y.
AN ATLAS OF INFRARED SPECTRA OF FLAMES. PART I. INFRARED SPECTRA OF HYDROCARBON FLAMES IN THE 1-5 MICRON REGION,
by Lowell R. Ryan, Gunter J. Penzias and Richard H. Tourin. July 61, 100p. incl. illus. 28 refs. (Scientific rept. no. 1)
(Contract AF 19(604)6106)
(AFCRL-848) Unclassified report

DESCRIPTORS: (*Flames, *Infrared spectroscopy, Exhaust gases, Combustion chambers, Infrared radiation, Absorption, Measurement, Hydrocarbons, Oxygen.) (Atmosphere, Pressure, Temperature, Atomization, Tests.) (Instrumentation, Optical equipment, Monochromatic light, Collimators, Infrared lamps, Blackbody radiation.)

An experimental combustion system and infrared instrumentation were set up to measure infrared emission and absorption spectra of flames under controlled conditions. Infrared spectra of hydrocarbon-oxygen flames were measured in the 1 - 5 micron region, at atmospheric pressure. Spectral emissivities and spectral radiant emittances were calculated from the measurements and plotted as functions of wavelength. Temperatures were determined from the spectral data by the infrared monochromatic radiation method, at various wavelengths. Results show only moderate dependence of infrared radiance on fuel composition per se, but strong dependence upon temperature and temperature distribution. These results are in accord with expectations, based on measurements of radiation from heated gas samples and on calculations of molecular energy distributions. (Author)

AD-269 174 Div. 25, 26
(TISTM/EJH) OTS price $1.10

Alloyd Corp., Cambridge, Mass.
A FUNDAMENTAL STUDY OF ROLLING CONTACT FATIGUE.
Quarterly progress rept. no. 2, 1 Aug-1 Nov 61, by N. W. Kirshenbaum. 1 Nov 61, 5p. incl. table, 3 refs.
(Contract NOw-61-0656-c)
Unclassified report

DESCRIPTORS: (*Fatigue (Mechanics), Lubrication, Roller bearings, Ball bearings.) (*Single crystals, *Lithium compounds, *Fluorides, Stresses, Elasticity, Mechanical properties, Chemical milling, Abrasion, Pickling.) Test equipment.

Contents: Testing apparatus: Testing machine for rolling ball on single crystal; Balls for rolling on single crystals of LiF; Lithium fluoride crystals: Cleavage; Polishing and etching

AD-269 200 Div. 25
(TISTM/EJH) OTS price $8.10

Hammond Metallurgical Lab., Yale U., New Haven, Conn.
THE SELF DIFFUSION OF LEAD - 210 IN SINGLE CRYSTALS OF LEAD SULFIDE AS A FUNCTION OF STOICHIOMETRY AND DOPING ADDITIONS,
by George Simkovich and J. Bruce Wagner, Jr. 17 Dec 61, 20p. illus. tables, 19 refs. (Technical rept. no. 4)
(Contract Nonr-60934)
Unclassified report

DESCRIPTORS: (*Lead, Diffusion, *Single crystals, *Lead compounds, *Sulfides, Impurities, Bismuth, Silver, Sulfur, Test methods.) (Semiconductors, Labeled substances, Controlled atmospheres, High temperature research.)

Measurements of the self diffusion of Pb-210 into undoped and doped single crystals of Pbs of known dislocation density have shown that in the temperature range of 500 to 800 C, the diffusion is predominantly via Frenkel defects. In the case of n-type, undoped PbS and p-type, Ag doped PbS the diffusion coefficients were larger than for undoped, stoichiometric PbS. Conversely for p-type, S excess undoped PbS and for n-type, Bi doped solid solutions, the diffusion coefficients were larger than for undoped stoichiometric PbS. (Author)

AD-269 221 Div. 25, 17, 2
(TISTP/MFA) OTS price $1.00

Allison Div., General Motors Corp., Indianapolis, Ind.
INVESTIGATION OF THE EFFECTS OF MAGNETIC FLUX ON DISLOCATION MOVEMENT AND ALIGNMENT.
Rept. for Mar 60-May 61 on Metallic Materials, by Alfred C. Eckert, Jr. and Howard W. Newman. Sep 61, 30p. incl. illus. table, 23 refs.
(Contract AF 33(616)7116, Projs. 7381 and 7351)
(ASD TR 61-217) Unclassified report

DESCRIPTORS: (*Grains (Metallurgy), Deformation, Stresses, Ferromagnetic materials, Crystal structure, Magnetic effects, Nickel.) (X rays, Reflection, *X-ray diffraction analysis, Photographic analysis, X-ray diffraction cameras.)

Observations have led to the hypothesis that under some conditions, magnetic flux influences the movement of dislocations within the grains of a ferromagnetic material. Based on X-ray diffraction extinction contrast, a technique was derived from the work on this project that makes it possible to make a direct observation of dislocations in nickel foil samples; the dislocation movements can thereby be followed when the samples are subjected to magnetic flux. An unmistakable change in the imperfection structure was observed. It is recommended that this observation be followed by a more complete investigation of the nature of the change and the manner in which it is influenced by magnetic flux. (Author)

AD-269 226 Div. 25, 14
(TISTM/EJH) OTS price $2.60

General Electric Co., Schenectady, N. Y.
STRUCTURE OF VITREOUS AND LIQUID BORON TRIOXIDE AND SOME SIMPLE BORATES.
Rept. for 1 May 58-15 Feb 61,
by J. D. Mackenzie. Sep 61, 18p. incl. illus. tables, 37 refs.
(Contract AF 33(616)5699, Proj. 3048)
(ARL-73) Unclassified report

DESCRIPTORS: (*Boron compounds, *Oxides, Crystals, Single crystals, Preparation, Liquids, *Glass, Phase studies, Phase transitions, Crystal structure.) (Liquids, Viscosity, Electrical properties, Conductivity, Density, Water.) (*Borates, Sodium compounds, Viscosity.) (High temperature research, High pressure research, Infrared spectroscopy, Nuclear magnetic resonance.)

Research was conducted to obtain structural information on the vitreous and liquid B2O3 and binary borates. By the use of high-pressure techniques, simple crystals of two forms of B2O3 were prepared for x-ray diffraction studies. The tentative phase diagram for liquid and crystalline B2O3 was constructed up to 1100 C and 90,000 atmospheres. The effects of water on the viscosity, electric conductance, and density of liquid B2O3 were examined indicating that some of the current hypotheses concerning the structure of liquid B2O3 can be rejected. Preliminary results on the IR absorption of solid and liquid B2O3 were obtained. Other work in progress includes nuclear magnetic resonance absorption, viscosity measurements of binary borates at temperatures below the liquidus, and single-crystal diffraction on alpha-and beta-B2O3. (Author)

AD-269 234 Div. 25
(TISTP/MFA) OTS price $6.60

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
THEORETICAL PREDICTION OF PLASTIC STRAINS OF POLYCRYSTALS,
by Bernard Budiansky and Tai Te Wu. Nov 61, 27p. incl. illus. tables, 22 refs. (Technical rept. no. 12)
(Contract Nonr-186602)
Unclassified report

DESCRIPTORS: (Stresses, Deformation, Crystals, Elasticity, *Plasticity, Crystal structure, *Shear stresses, Grains (Metallurgy).) (Tensile properties, Tensor analysis, Transformations (Mathematics), Integrals, Integral equations, Theory.) *Tables.

Plastic strain is considered a consequence of slipping on some of the 12 slip systems of face-centered-cubic single crystals. The polycrystal is assumed to be macroscopically homogeneous and initially isotropic -- that is, the crystal orientations, sizes, shapes and locations are random and uncorrelated. The rotations of the grains during deformation are neglected, and the average plastic strain in grains of a given orientation is calculated on the basis of the assumption that the grains under consideration are spherical and elastically isotropic. (Author)

AD-269 252 Div. 25
(TISTP/MFA) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College, Park.
THE STABILITY OF THE PINCH WITH ANISTROPIC PRESSURE,
by R. K. Jaggi. Dec 61, 26p. illus. 15 refs.
(Technical note no. BN-269)
(Contract AF 18(600)1315)
(AFOSR-1896) Unclassified report

DESCRIPTORS: (*Magnetic pinch, *Stability, *Plasma physics, Pressure.) (Magnetic fields, Vacuum systems, Metals, Cylindrical bodies, Thermal conductivity.) (Perturbation theory, Partial differential equations, Linear systems, Tensor analysis, Scattering.)

A dispersion equation is obtained for the stability of the pinch from the hydromagnetic equations supplemented by an equation for the pressure tensor of the ions. The dispersion equation is obtained for the marginal instability case only. It is observed that this dispersion equation coincides with the dispersion equation obtained from the Chew, Goldberger and Low (Pro. Roy. Soc. A236 (1956) 112) equations for the marginal instability case. It is concluded that the region of the stability predicted from the equations that we have used is slightly more than that given by the kinetic equation used by Chandrasekhar, Kaufmann and Watson (Proc. Roy. Soc. A245 (1958) 435). (Author)

AD-269 259 Div. 25, 15
(TISTP/TL) OTS price $1.25

Minnesota U., Minneapolis.
TRANSIENTS IN CERTAIN AUTONOMOUS MULTIPLE DEGREE OF FREEDOM NONLINEAR VIBRATING SYSTEMS.
Rept. for Jan-June 61,
by P. R. Sethna. Oct 61, 37p. incl. illus. 12 refs.
(Contract AF 33(616)6828, Proj. 7351)
(ASD TR 61-449) Unclassified report

DESCRIPTORS: (Dynamics, Oscillation, *Vibration, Analysis.) (Potential theory, Resonance, Frequency, Damping, Theory.) (*Harmonic analysis, Polynomials, *Matrix algebra, Fourier analysis, Differential equations, Integration, Functions, *Non-linear differential equations.)

Oscillations of weakly nonlinear autonomous multiple degree of freedom dynamical systems are studied. The analysis includes nonlinear effects arising from the potential as well as the kinetic energies of the systems and the systems include elements that produce nonlinear dissipative forces. The method of averaging is applied to a suitably transformed set of equations. In several important cases nonperiodic solutions for arbitrary initial conditions are obtained by quadratures. (Author)

AD-269 280 Div. 25, 9
(TISTP/MFA) OTS price $9.10

Rocket Research Lab., Ohio State U., Columbus.
MAGNETOHYDRODYNAMIC EFFECTS ON EXOTHERMAL WAVES. I. THEORETICAL PROBLEMS ON A MACROSCOPIC SCALE. II. EXPERIMENTAL STUDY WITH HYDROGEN-OXYGEN DETONATION WAVES.
Rept. on Research on Combustion Kinetics,
by Michael C. Fong, Loren E. Bollinger and Rudolph Edse. Sep 61, 90p. incl. illus. tables, 25 refs.
(Contract AF 33(616)5615, Proj. 7013)
(ARL 69) Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Gas flow, Gas ionization, Chemical reactions, Heat, Flames, *Electromagnetic waves, Hall effect, Thermodynamics, Thermal conductivity, Hydrogen, Oxygen, Shock waves.) (Experimental data, Tables of Chemical properties, Physical properties.) (Partial differential equations, Linear systems, Perturbation theory.)

Various problems associated with the macroscopic magnetohydrodynamic effects on an exothermal wave were treated on the basis of one-dimensional flow considerations. A steady exothermal wave traveling in an ionized medium under the influence of a transverse magnetic field was found to display properties similar to those of a classical detonation or deflagration wave. For a hydromagnetic exothermal wave, it was found that a discontinuity either in thermodynamic quantities or in magnetic field strength appears as soon as the flow reaches the transition region.

AD-269 291 Div. 25
(TISTP/MFA) OTS price $1.60

RIAS, Inc., Baltimore, Md.
THEORY OF GRAVITATION AND ELECTROMAGNETISM.
Final technical documentary rept. on Gravitational and Electromagnetic Field Physics, by Louis Witten. Aug 61, 11p. 14 refs.
(Contract AF 33(616)6437, Proj. 7114)
(ARL-41) Unclassified report

DESCRIPTORS: (*Electromagnetic theory, *Gravity, Electromagnetic fields, Neutrinos, Energy, Wave transmission, *Relativity theory.) (Tensor analysis, Differential geometry, Differential equations.)

A rederivation of the Rainich theory by use of four-component spinors, a spinor classification of empty space-times, a study of static cylindrically symmetric solutions of the Rainich equations, and investigations concerning the initial value problem are presented. Also included was an attempt to write a set of equations involving only geometric quantities which would be equivalent to the gravitational-neutrino equations and a study of the gravitational field of a fast-moving mass. The imcompleteness of the Rainich theory as a physical theory is discussed and the implifications for future work is given. (Author)

AD-269 292 Div. 25, 8
(TISTM/TCG) OTS price $3.60

David Sarnoff Research Center, Princeton, N. J.
HIGH TEMPERATURE SEMICONDUCTOR RESEARCH.
Scientific rept. no. 7, 1 Apr-30 June 61, ed. by L. R. Weisberg. 31 Oct 61, 34p. incl. illus. tables.
(Contract AF 19(604)6152)
(AFCRL-973) Unclassified report

DESCRIPTORS: (*Semiconductors, *Semiconducting films, Gallium compounds, Arsenides, Phosphides, Intermetallic compounds, Single crystals, Chemical impurities, Phase transitions, *High temperature research.) (Crystals, Growth, Crystallization, Pressure, Preparation, High pressure research, Hazards.) (Electrical properties, Resistance, Heat of reaction, Thermodynamics, Measurement, Test methods, Test equipment.) (Vapors, Iodine, Transport properties.)

A study was made of the cause of explosions in the high pressure magnetic Czochralski apparatus for the growth of GaP. All explosions were ascribed to either a discharge from the R. F. coil, a mechanical failure of quartz members, or an overheating of the P reservoir. The stoichiometric melting point for GaP is 1467 + or -10 C at a dissociation pressure of 30 or -10 atm. The gas phase transport of GaAs with I2 was studied by measuring the optical absorption in the vapor; no free I2 is present in the system. The heat of reaction was 41 kcal/mole GaI. A study was made of factors affecting the crystallinity of GaAs ingots grown in quartz boats; abrasive blasting the boat instead of etching with HF acid, reduces the wetting of the boat by the melt, and results in a markedly improved crystallinity. A Ga rich melt causes increased supercooling and poorer crystallinity. The higher the As pressure, the better is the crystallinity, except that above about 2 atm the crystals are excessively porous. (Author)

AD-269 308 Div. 25, 15
(TISTP/TL) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
LANDAU DAMPING AND THE ATTENUATION OF WHISTLERS.
by F. L. Scarf. Mar 61, 33p. incl. illus. tables, 15 refs. (Rept. no. 2301-0002-RU-000)
(Contract AF 04(647)302)
(AFBMD TR 61-33) Unclassified report

DESCRIPTORS: (*Plasma physics, Dynamics, *Electromagnetic waves, Electromagnetic properties, Electromagnetic fields, Oscillation, Damping, Electric fields, Propagation, Quantum mechanics, Analysis.) (Gases, Electrons, Temperature, Terrestrial magnetism, Magnetic fields, *Very low frequency.) (Particles, Absorption, Kinetic theory, Cyclotrons, Resonance, Cerenkov radiation, Heat transfer.) (Nonlinear differential equations, Numerical analysis, Integral transforms, Equations, Partial differential equations, Integral equations, Integration.)

Transverse electromagnetic oscillations in a gyrotropic plasma exhibit Landau damping when the wave is not monochromatic. The dependence of the damping on the equilibrium distribution and the boundary (or initial) values is investigated. The resulting dispersion relation is interpreted by examining the response of a single free electron to an incident wave. It is shown that the damping mechanism is associated with the Doppler shift caused by the thermal distribution, so that some particles are in cyclotron resonance for any laboratory frequency. The correlation of whistler data with this complex dispersion relation can be used to evaluate electron temperatures at several earth radii. (Author)

AD-269 321 Div. 25
(TISTP/WH) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
SMALL DEFLECTIONS OF NON-UNIFORM BEAMS,
by Roy Gundersen. Sep 61, 17p. 24 refs. (MRC Technical summary rept. no. 263)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Beams, *Deflection, Mathematical analysis, Integral transforms, Integrals, Functions.) (*Deformation, Mathematical analysis, Stresses, Integral transforms, Integrals, Functions.)

Laplace transform techniques are used to obtain general solutions for small deflections of non-uniform beams subjected to transverse loading. Solutions are first obtained for a beam whose cross-section is composed of a sum of step functions (stepped beam). Using a sum of step functions to approximate a beam with continuously varying cross-section and carrying out a limiting process, a solution is obtained in terms of Stieltjes integrals. (Author)

AD-269 328 Div. 25, 15
(TISTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ASYMPTOTIC PHENOMENON IN LARGE ROTATION,
by B. R. Seth. Nov 61, 16p. 8 refs. (MRC technical summary rept. no. 271)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Cylindrical bodies, *Bodies of revolution, Deformation, Elasticity, Plasticity, Continuum mechanics, Mathematical analysis, *Stresses.) (Tensor analysis, Functions, Integration, Differential equations, Nonlinear systems.)

In cylinders subjected to large torsion, it is found that for large values of the twist the solution of the non-linear differential equation giving the radial displacement, approaches an asymptotic value, which suggests the setting in of the plastic state on the outer boundary of the cylinder. The case of rapidly rotating cylinders is treated. The stress-strain relation changes on the axis of the cylinder where the transition from the elastic to a plastic state takes place. The radial displacement again satisfies a non-linear differential equation. Its asymptotic solution occurs at a definite value of the angular velocity and shows that the rate of change of the ordinary strains at the center is finite and not zero as in the elastic or classical plastic case. This angular velocity corresponds to what we obtain by using the yield condition, but, its value is somewhat greater than that given by the classical plastic theory. The plastic state first sets in on the axis of the cylinder, and hence, as indicated by the asymptotic solution, it is expected that the ordinary strains will decrease from the axis towards its outer surface at a definite rate. (Author)

AD-269 341 Div. 25, 26
(TISTW/EJH) OTS price $1.60

TYCO, Inc., Waltham, Mass.
THE TRAVELLING SOLVENT METHOD OF CRYSTAL GROWTH.
Quarterly rept. nc. 2, 16 Aug-15 Nov 61,
by A. I. Mlavsky. 1 Dec 61, 6p. incl. illus.
(Contract AF 19(604)8803)
(AFCRL-1117)
Unclassified report

DESCRIPTORS: (*Gallium compounds, *Arsenides, Gallium, *Silicon compounds, *Carbides, Chromium, *Intermetallic compounds, Crystals, *Single crystals, Growth, Preparation, Solvent action, Test methods.) (Semiconductors, Sandwich construction.) (Laboratory equipment, Crystal ovens.)

Work was carried out in the following areas: The GaAs - Ga System: (1) investigation of the dissolution of GaAs in liquid Ga; (2) passing a liquid Ga zone through GaAs to produce a single crystal of GaAs; and (3) construction of an apparatus to investigate the applicability of the peltier effect to zone movement. The SiC - Cr System: (1) construction of an apparatus to investigate the feasibility of passing liquid Cr zones through SiC; and (2) preliminary zone movement experiments. (Author)

AD-269 363 Div. 25, 30
(TISTP/MFA) OTS price $2.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
ULTRASONIC TEMPERATURE DETERMINATIONS IN A PLASMA,
Rept. on WS107A-2,
by Edmund H. Carnevale, Howard L. Poss, and Jerrold M. Yos. 19 June 61, 21p. incl. illus. table (Technical rept. no. RAD-TR-61-13)
(Contract AF 04(647)305)
Unclassified report

DESCRIPTORS: (*Plasma physics, Ultrasonics, Sound transmission, Temperature, Measurement, Crystals, Quartz crystals, Barium compounds, Titanates.) (Transport properties, Relaxation time, Excitation, Recombination radious.) (Instrumentation, Cameras, Oscilloscopes, Pulse generators, Cathode tubes.) (Equations, Experimental data.)

An ultrasonic pulse technique for measuring gas temperatures in an internal combustion engine was used to determine temperatures in an electric arc plasma jet. Measurements of sound velocity at one mc per sec were obtained in high-temperature air, argon, and helium at atmbspheric pressure. Temperatures are calculated from these sound speeds on the assumption that only the translational and rotational degrees of freedom are excited by the sound wave, while vibration, dissociation, and electronic excitation remain frozen. The temperatures determined in this way range from 3500 to 8000 K. In the case of the air arc, the ultrasonic temperature measurements are compared with temperatures determined from an energy balance on the plasma jet. The average temperatures obtained by the two methods agree within 10 percent over the temperature and enthalpy range considered. The results also show that temperature fluctuations as high as 50 percent can occur during a given arc run. A discussion of the experimental apparatus, method of measurement, experimental results, and analysis is presented. (Author)

AD-269 373 Div. 25
(TISTP/MFA) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
THE APPLICATION OF THE IMPULSE APPROXIMATION TO THE SCATTERING OF ELECTRONS BY ATOMS: I. INELASTIC SCATTERING BY HYDROGEN ATOMS,
by R. Akerib and S. Borowitz. 30 June 60, 22p. incl. illus. table (Rept. no. ZPh-092)
(Contract DA 04-495-ORD-3112)
Unclassified report

DESCRIPTORS: (*Inelastic scattering of *Electrons by Hydrogen, Atoms.) (Transport properties, Particles, Continuum mechanics, Wave transmission, Proton cross sections, Ionization.) (Transformations (Mathematics), Integral equations, Fourier analysis.)

A calculation of the ionization cross section and the excitation cross section to the 2S and 2P states of hydrogen atoms by collision with electrons is carried through by the use of an impulse approximation. Results are then compared to the experimental data and to various other theoretical calculations. The cross sections obtained compare favorably with experiment. The calculations carried out by these methods are no more complicated than the usual approximation methods and are easily adaptable for use with more complicated atoms. (Author)

AD-269 382 Div. 25
(TISTP/MFA) OTS price $4.60

General Dynamics/Convair, San Diego, Calif.
EFFECT OF SUBLIMATION ON STAGNATION POINT HEAT TRANSFER,
by W. W. Short and T. A. Dana. 14 Mar 61, 42p. incl. illus. tables, 16 refs. (Rept. no. ZPh-085)
(Contract DA 04-495-ORD-3112)
Unclassified report

DESCRIPTORS: (*Solids, Solid state physics, *Heat transfer, *Sublimation.) (Laminar boundary layer, Gas flow, Ablation.) (Tests, Carbon dioxide, Cylindrical bodies.) (Laboratory equipment, Calorimeters, Oscilloscopes, Copper, Thermocouples.) (Experimental data, Tables.)

The reduction of heat transfer to carbon dioxide models caused by the subliming solid was measured experimentally. Heat transfer coefficients were obtained for 0.7-cm-diam copper and carbon dioxide hemisphere-cylinders in air at 500 to 800 C moving at 100 to 300 cm/sec. The ratios of the subliming to the non-subliming coefficients were higher than the theory at high mass transfer rates. At 0.0084 gm/sq.cm-sec, which was the highest mass transfer rate obtained, the heat transfer rate was reduced by 65%. (Author)

AD-269 420 Div. 25, 1, 12
(TISTE/CDM) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
STUDY OF THE DISSIPATION OF INTERNAL ENERGY IN A VIBRATING BEAM.
Master's thesis,
by George Robert Blitch and Joseph Green.
Aug 61, 63p. incl. illus. tables, 10 refs.
(Rept. no. GAE/Mech 61-10)
Unclassified report

DESCRIPTORS: (Theses, *Cantilever beams, *Vibration, *Damping, Hysteresis, Test methods, Tests, Mathematical analysis, Differential equations.) (*Satellite vehicles, Design, Theory, Stresses, Structures.)

Efforts were devoted to the dissipation of internal energy in a vibrating cantilever beam represented by the area of the hysteresis loop formed by the loading and unloading curves. In a cantilever beam undergoing forced transverse vibration, the phenomenon of internal damping appears as a small non-linear term in the equation for the energy contained in the beam due to the deflection of the beam. The energy loss per cycle in the beam, measured by experimental techniques, is equal to the area of the hysteresis loop. The equations of the hysteresis loop contain parameters which are characteristic of the material in the beam. A detailed experimental study, based on the present analysis and design, will determine the nature and applicability of the characteristic parameters. (Author)

AD-269 499 Div. 25
(TISTA/WAW) OTS price $6.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
DIAGNOSTICS OF A PLASMA FLAME EXHAUSTING TO ATMOSPHERIC PRESSURE,
by W. K. McGregor, Jr., M. T. Dooley, and L. E. Brewer. Jan 62, 65p. incl. illus. tables (AEDC TR 61-16)
(Contract AF 40(600)800, Proj. 8951)
Unclassified report

DESCRIPTORS: (Plasma physics, *Plasma jets, Gas ionization, Helium, *Argon, Temperature, Measurement, Instrumentation, Spectrographic analysis.) (Plasma jets, Exhaust gases, Exhaust flames, Thermal radiation, Mathematical analysis.)

A spectrometric method to measure temperature in a high temperature gas stream produced by a Gerdien-type arc plasma generator was developed. The Fowler-Milue peaking function method was employed which utilized both the spectral line and continuum radiation in the 4000 A range from an argon plasma. Excitation temperatures measured from line radiation and electron temperatures determined from the continuum radiation agreed within about five percent. The method was applicable provided temperatures larger than 16,000 K existed at the center of the axisymmetric jet; the range of temperature measurement was then from about 7000 to 28,000 K. Comparison of the average temperature obtained using the spectrometric method with the average temperature obtained using an energy balance indicated serious disagreement. Comparison of the total enthalpy obtained using the spectral temperature with that obtained from the energy balance also indicated disagreement. The reason for the disagreement was that the jet consisted of high frequency arc channels moving about in the stream and that the radiant emission resulted from these high temperature electrons rather than from the average gas atoms. (Author)

AD-269 514 Div. 25, 4, 30
(TISTM/TCG) OTS price $2.60

Callery Chemical Co., Pa.
DETERMINATION AND ANALYSIS OF THE POTENTIALITIES OF THERMAL ENERGY STORAGE MATERIALS.
Quarterly rept. no. 2, 1 Oct-31 Dec 61,
by H. W. Wilson. 31 Dec 61, 18p. incl. illus. tables.
(Contract AF 33(616)7224)
Unclassified report

DESCRIPTORS: (*Materials, High temperature research, Storage, Thermodynamics', Heat of fusion, Thermal conductivity, Energy, Specific heat, Analysis.) (*Containers, *Crucibles, Alloys, Additives, Chromium, Liquids, Melting, *Lithium compounds, *Borates, Corrosion inhibition.) (*Calcium compounds, Silicides, *Sodium compounds, Fluorides.) (Laboratory equipment, *Calorimeters, *Laboratory furnaces, Tests.)

Extensive tests were conducted to find a metal suitable as a container for molten LiBO2 at 1600 F. Test results indicated an increasing corrosion resistance with increasing Cr content of the alloys. Additional tests are scheduled with alloys containing a high percentage of Cr. Drop-calorimetric measurements on CaSi2 produced heat content data to 470 C. The thermal conductivity apparatus was modified. Measurements

were made on molten NaF at 1020 C; an approximate thermal conductivity value of 5.7 btu/hr sq ft F/ft was obtained. Construction of the furnace-calorimeter apparatus for measurement of heat release rates was completed except for the Ni calorimeter block. (Author)

AD-269 523 Div. 25, 17
(TISTM/TCG) OTS price $2.00

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
RESEARCH ON FINE PARTICLE MAGNETIC MATERIALS.
Final rept., 1 Mar 57-28 Feb 61,
by W. J. Schuele. Sep 61, 64p. 18 refs.
(Rept. no. F-A2386-1)
(Contract AF 33(616)6922, Proj. 7021; Continuation of Contract AF 33(616)5041)
(ARL-66) Unclassified report

DESCRIPTORS: (*Ferromagnetic materials, *Ferrites, *Magnetic materials, Particles, Magnetism, Preparation, Magnetic properties, Crystal structure, Lattices, X-ray diffraction analysis, Electron diffraction analysis, Electron microscopy.) (Nickel compounds, Iron compounds, Cobalt compounds, *Borides.) (Cobalt compounds, Nickel compounds, Copper compounds, *Iron compounds, Reduction, Hydrogen, Oxidation, Air, *Intermetallic compounds.) (*Oxalates, Sodium compounds, Borohydrides, Precipitation.)

Ferromagnetic and ferrimagnetic fine particles were prepared by suitably heat treating coprecipitated oxalates of the systems Co-Fe, Ni-Fe and Cu-Fe in a wide range of compositions. Decomposition of the oxalates in H produced fine particle metals or alloys, decomposition in air produced ferrites at temperatures as low as 400 C. Smaller particles were prepared by addition of the oxalates into molten KNO3. Extremely fine particles were prepared by a precipitation process, and grown by a hydrothermal process providing a series of ferrite particles from 25 to several hundred angstroms. Magnetic measurements and physical measurements using x-ray diffraction, electron diffraction, and electron microscopy techniques were used. The magnetic and structural data were analyzed in terms of the theory of ferromagnetic fine particle. Metal borides of Ni, Fe, and Co were prepared as fine particles using Na borohydride as the precipitating agent. (Author)

AD-269 553 Div. 25, 30
(TISTP/WH) OTS price $10.50

Lockheed Aircraft Corp., Marietta, Ga.
MAIN PROPELLANT TANK PRESSURIZATION SYSTEM STUDY AND TEST PROGRAM. VOLUME IV. COMPUTER PROGRAM.
Final rept., 1 July 60-31 Oct 61.
Dec 61, 136p. incl. illus. tables. (Rept. no. ER-5296)
(Contracts AF 04(611)6087 and AF 04(611)7032, Proj. 6753)
(SSD TR 61-21, vol. 4) Unclassified report

DESCRIPTORS: (Guided missiles, Fuel tanks, *Propellant tanks, *Heat transfer, Aerodynamic heating.) (Thermodynamics, Equations, Digital computers, *Programming.) (Pressure tanks, Gases, Heat transfer.)

A computer program which can be used to determine the pressurizing gas requirements for a missile propellant tank pressurization system is described. The program is applicable to both cryogenic and storable propellants when pressurized with stored gas, evaporated propellant, and main tank injection methods of pressurization. (Author)

AD-269 562 Div. 25
(TISTP/JW) OTS price $1.60

New York U. Coll. of Engineering, N. Y.
TRANSIENT ANALYSIS OF INTERACTING DYNAMICAL SYSTEMS BY THE PRINCIPLE OF ENERGY TRANSFORMATION,
by S. S. L. Chang. Feb 61, 8p. incl. illus.
(Technical rept. no. 400-22)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-64) Unclassified report

DESCRIPTORS: (Energy, *Transformers, Transducers, *Electromechanical converters, Circuits, Electrical networks.) (Non-linear differential equations, Linear systems.)

An energy transformer is defined as a reversible device which converts free energy of one form into another and vice versa. Basic transformer equations are derived for these devices which are good for both steady-state as well as transient operations. Using the transformer analogy, interacting systems can be represented by a single equivalent circuit from which transient and steady-state responses and interacting effects can be calculated. The method is applicable to nonlinear as well as linear systems. Examples are given to illustrate its applications in electromechanical and hydromechanical systems. (Author)

AD-269 568 Div. 25, 8
(TISTP/JW) OTS price $12.50

New York U. Coll. of Engineering, N. Y.
THEORY OF OPTIMUM MULTIPLE MEASUREMENTS.
Master's thesis,
by James C. Hung. Aug 61, 167p. incl. illus. tables, 47 refs. (Technical rept. no. 400-36)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-1550) Unclassified report

DESCRIPTORS: (*Integral transforms, Integral equations, Matrix algebra, Spectrographic analysis.) (Radio signals, Noise (Radio), Information theory.) Theses.

Multiple measurements with random inputs are studied. Methods of weighting and combining the measured signals are proposed. The relationships between the measured signals and the desired signal are assumed linear and time-invariant; the random inputs are assumed stationary with rational spectral density functions; the criterion of performance used is to minimize the mean squared value of the continuous error between the estimate and the desired signal; and the weighting operations are assumed linear. Two kinds of single-rate systems are studied: Single-rate multiple measurements with known spectral density functions of signal and noise, and Single-rate multiple measurements with known noise but unknown signal spectral density functions. A new method employing the frequency domain optimization theorems together with factorization theorems of rational matrices is proposed for obtaining the optimum system of the first kind. (Author)

AD-269 570 Div. 25, 15
(TISTP/TL) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELEMENTARY LATTICE THEORIES AND THEIR APPLICATION TO GAS ADSORPTION PHENOMENA,
by J. M. Honig. 11 Dec 61, 29p. incl. illus. 20 refs. (Technical rept. no. 252)
(Contract AF 19(604)7400)
Unclnssified report

DESCRIPTORS: (*Lattices, Theory, *Liquids, *Gases, *Solids, Absorption, Physical properties.) (Molecules, Particles, Velocity, Density, Entropy.) (*Quantum statistics, Probability, Integration, Statistical distribution.)

A review of certain lattice theories is presented for deriving Flory's formula for the free energy of a solution consisting of monomer and polymer molecules. The results are then reformulated, making them applicable to simple liquids regarded as a binary mixture of highly symmetric molecules and fractional-sized holes. These results are adapted to provide a theory of gas adsorption in which the fractional hole size concept is utilized. One obtains isotherm equations and expressions for the partial molecular configurational entropies in which the hole size parameter r makes its appearance. For r equals 1, the results reduce to the zero-order Fowler-Guggenheim results; it is pointed out that certain symmetry properties no longer obtain when r exceeds 1. The theory is compared with experimental work on certain types of adsorbent-adsorbate systems. (Author)

AD-269 583 Div. 25
(TISTP/MFA) OTS price $9.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
STARK EFFECTS IN THE NEAR INFRARED SPECTRA OF SIMPLE POLYATOMIC MOLECULES,
by P. D. Maker. May 61, 103p. incl. illus. tables, 37 refs. (Rept. no. 03640-1-T)
(Contract AF 19(604)6125)
(AFCRL-681) Unclassified report

DESCRIPTORS: (*Atomic spectrum, *Electric fields, *Infrared spectroscopy, *Molecules.) (Dipole moments, Polarization, Quantum mechanics, Energy.) (Optics, Light transmission, Optical equipment, Molecular beams.) (Coatings of Aluminum, Chromium, Gold.) (Reflection, Diffraction gratings, Collimators.)

A survey was made of Stark effects in the vibration-rotation spectra of simple polyatomic molecules. Employing a light guide type Stark absorption cell 90 cm long having front surfaced mirrors as parallel plate electrodes, fields of 120 kV/cm could be obtained with sample pressures 1/4 mm Hg. The electrode spacing of 0.2 to 0.5 mm was evaluated by examining the fringe systems produced upon passing light through the cell perpendicular to its optical axis. For this purpose, partially transparent mirror electrodes were used. An Ebert-Fastie spectrometer of three meter focal length and equipped with a 300 line/mm grating 200 mm long afforded a resolving power in excess of 75,000 when used double passed. Liquid air cooled PbS detectors and synchronous amplifiers were used. (Author)

AD-269 595 Div. 25, 17
(TISTP/MFA) OTS price $1.75

Manufacturing Labs., Inc., Cambridge, Mass.
THERMODYNAMICS OF INTERSTITIAL SOLID SOLUTIONS.
Rept. for Sep 59-Sep 61 on Refractory, Inorganic and Nonmetallic Materials,
by Larry Kaufman. Oct 61, 61p. incl. illus. tables, 47 refs.
(Contract AF 33(616)6788, Proj. 7350)
(ASD TR 61-445) Unclassified report

DESCRIPTORS: (*Thermodynamics, Chemical equilibrium, *Phase transitions, *Eutectics, Solid state physics.) (Metals, Iron, Carbon, *Intermetallic compounds, Alloys.) (Crystal structure, Metallurgy, Crystals, Lattices.) (Melting, Temperature, Tables.)

The thermodynamics of interstitial solid solutions in terms of the contributions of positional and vibrational entropy and zero point enthalpy was considered in detail for ideal and restricted interstitial solutions. The results were applied to calculation of phase equilibria in interstitial iron-carbon alloys at one atmosphere and high pressure. Comparison with observations on kinetics of the bainite reaction and high pressure equilibria action yields good agreement. A method evolved for computing the entropy of solutions and intermetallic compounds from 0 K to the melting point was applied to 35 NaCl type compounds (including high melting carbides, oxides and nitrides). These computations compare favorably with experimental data. A study of the interstitial solutions in the titanium-oxygen system indicates that the high temperature stability of the h.c.p. solution is due to the enthalpy of formation. (Author)

AD-269 635 Div. 25, 14, 26
(TISTM/EJH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
INTERFERENCE LIGHT FILTERS FOR THE ULTRAVIOLET REGION OF THE SPECTRUM,
by A. Yu. Klement'yeva. 17 Aug 61, 6p. incl. illus. (Trans. no. MCL-1204/1 of Vestnik Moskovskogo Universiteta, Seriya 3, Fizika Astronomiya 1:23-26, 1960)
Unclassified report

DESCRIPTORS: (*Optical filters, *Ultraviolet filters, Optical coatings, Optical materials, Materials, Films, *Dielectric films, Dielectrics, Magnesium compounds, Fluorides, Lead compounds, Chlorides, Manufacturing methods, Thickness, Control, Light transmission.) USSR, Laboratory equipment, Vacuum operations.

A method for producing dielectric interference light filters for the UV region of the spectrum and the features of the apparatus developed for this purpose are discussed. This new method was used to produce narrow-band dielectric light filters of a specific wavelength, with surface uniformity for the 3000-4000 angstroms region. The results can be used to set up large-scale production of light filters for the UV region at plant laboratories. (Author)

AD-269 643 Div. 25, 10
(TISTM/EJH) OTS price $1.10

Foreign Tech. Div., Air Force Systems, Command, Wright-Patterson Air Force Base, Ohio.
DETERMINING THE DENSITY OF LIQUID OXYGEN WITHIN

A WIDE RANGE OF TEMPERATURES AND PRESSURES,
by D. L. Timrot and V. P. Borisoglebskiy.
17 Aug 61, 1p. (Trans. no. MCL-1258/1 of Teploenergetika 10:p. 95, 1960)
Unclassified report

DESCRIPTORS: (*Liquefied gases, *Oxygen, Density, Measurement, Temperature, Pressure, High pressure research, Thermodynamics, Cryogenics.) USSR.

The thermal properties of liquid O (LOX) were studied with a loaded piezometer. The amount of O discharged from the piezometer during the experiment was measured (in gaseous form) volumetrically. A precision experimental device was developed to study the density of LOX within the temperature range -190 to +120 degrees to pressures of 200 kg/sq cm, and also the density of LOX along the saturation curve in this same temperature range. The experimental data were processed analytically for presentation of the thermal properties of LOX in tabular form. Note: This abstract comprises the entire document. (Author)

AD-269 644 Div. 25, 2
(TISTP/MFA) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
DETERMINATION OF THE PARAMETERS OF PARTICLE-SIZE DISTRIBUTION,
by V. V. Lebedev and A. Ye. Makirov. 17 Aug 61, 9p. incl. illus. table, 8 refs. (Trans. no. MCL-1259/1 of Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika 4:60-65, 1960)
Unclassified report

DESCRIPTORS: (*Statistical functions, Distribution theory, Statistical distribution.) (*Particles, Analysis, Colloids, *Clouds, Fog.) (Light, Scattering, Intensity.) (Nomographs, Bessel functions.) USSR.

A mathematical device is developed that yields nomograms and which permits us to determine the particle-size distribution of suspensions, fogs, clouds, etc., from three measurements of the relative intensity of light scattered at small angles. (Author)

AD-269 649 Div. 25
(TISTP/JW) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
MEASUREMENT OF THE CORRELATION BETWEEN THE AMPLITUDE AND FREQUENCY FLUCTUATIONS IN A REFLEX KLYSTRON,
by S. K. Lesota. 17 Aug 61, 10p. incl. illus. 7 refs. (Trans. no. MCL-1271/1 of Vestnik Moskovskoga Universiteta, Fizika, Astronomiya 2:3-8, Mar-Apr 61)
Unclassified report

DESCRIPTORS: (Interference, Amplitude modulation, *Radiofrequency oscillators.) (*Klystrons, Power, Voltage.) USSR.

The interference method, used to measure the amplitude and frequency fluctuations in radio-frequency oscillators, is used to study the correlation dependence between the amplitude and frequency fluctuations in a reflex klystron with a three-centimeter range. Experimental graphs are given for the correlation function at several different voltage values on the reflector plate of the klystron; these correspond to the generation refion with the maximum generating power. (Author)

AD-269 654 Div. 25, 16
(TISTB/LH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
MAGNETISM AND LIFE,
by A. Emme. 17 Aug 61, 4p. (Trans. no. MCL-1303/1 of Komsomol'skaya Pravda, 4p., 18 Dec 60)
Unclassified report

DESCRIPTORS: *Magnetic fields, Magnetism, Biophysics, Plants, Animals, Growth, USSR.

AD-269 659 Div. 25
(TISTP/MFA) OTS price $2.60

Observatoire de Paris-Meudon (France).
THE FOUR MODES OF PROPAGATION OF ADIABATIC WAVES IN A PLASMA. RESEARCH ON A THEORY OF MAGNETOGAS DYNAMICS,
by J. L. Delcroix, J. F. Denisse and others.
5 Dec 60, 9p. illus. (Technical note no. 1, pt. 2)
(Contract AF 61(052)432)
(AFCRL-896) Unclassified report

DESCRIPTORS: (Electromagnetic waves, Wave transmission, *Wave analysis.) (*Plasma physics, Plasma oscillations, Ions, Electrons, Acoustics.) (*Magnetohydrodynamics, Hydrodynamics, *Resonance, Damping, Polarization.) (Experimental data, Tables.)

A study of wave propagation in an infinite uniform plasma is presented. In most experimental applications, the plasma is limited. The many problems that this situation introduces are not discussed. Only the structure of different waves in the simplest case of plane wave in an infinite medium is examined. (Author)

AD-269 661 Div. 25, 15
(TISTP/MFA) OTS price $3.60

Observatoire de Paris-Meudon (France).
RADIATION IN A PLASMA. I. CERENKOV EFFECT,
by M. H. Cohen. 5 Dec 60, 28p. illus. 13 refs.
(Technical note no. 1, pt. 1)
(Contract AF 61(052)432)
(AFCRL-855) Unclassified report

DESCRIPTORS: (*Plasma physics, *Cerenkov radiation, Continuum mechanics, Electromagnetic waves, Magnetic fields.) (Particles, Electrons, Ions, Fluid flow, Plasma oscillations.) (Fourier analysis, Differential equations, Transformations (Mathematics), Partial differential equations, Integral equations.) France.

A linear continuum theory of radiation in a plasma is developed and applied to several situations. The main departure from usual practice is the addition of source terms to the basic equations. The source so represented is arbitrarily set by an external agent. The source generates the disturbances in the plasma but is itself unchanged by the reaction of the fields. (Author)

AD-269 689 Div. 25, 17
(TISTM/EJH) OTS price $1.60

Pennsylvania U. School of Metallurgical Engineering, Philadelphia.
NEUTRON AND X-RAY DIFFRACTION STUDIES ON THE STRUCTURE OF WC AND A COMPARISON OF IT WITH EARLIER ELECTRON DIFFRACTION DATA.
Technical status rept. no. 1, 1 Feb-30 Sep 61 on Crystal Chemistry of Metallic Compounds,
by Erwin Parthe and Varadachari Sadagopan.
Nov 61, 9p. illus. table, 10 refs.
(Contract AF 49(638)1027; In cooperation with Massachusetts Inst. of Tech.)
(AFOSR-1721) Unclassified report

DESCRIPTORS: (*Tungsten compounds, *Carbides, Phase studies, *Crystal structure, Metallic crystals, Crystals, Neutron diffraction analysis, X-ray diffraction analysis, Electron diffraction analysis.) Metallic compounds.

A neutron diffraction study of WC reveals that WC crystallizes in a hexagonal form with one W atom in 000 and one C atom in 1/3 2/3 1/2. Neutron diffraction study in contradistinction to the electron and x-ray diffraction studies conclusively establishes that WC does not crystallize in the NiAs type structure. (Author)

AD-269 709 Div. 25
(TISTW/DLW) OTS price $9.60

Rutgers U., New Brunswick, N. J.
DEVELOPMENT OF ELECTRONIC VERNEUIL FURNACE.
Final rept.,
by William H. Bauer, Charles V. Longo, and Kasem Malek. 15 June 61, 72p. illus. 21 refs.
(Contract AF 19(604)5902)
(AFCRL-799) Unclassified report

DESCRIPTORS: (Laboratory furnaces, *Plasma jets, Plasma physics, *High temperature research, Single crystals, *Refractory materials, Electric discharges, Gas discharges, Radiofrequency power, Radiofrequency generators, Alternating current, Theory, Design.) (Crystal structure, Crystals, Growth.)

Research is concerned with the development of techniques for the growth of refractory single crystals by a modified Verneuil technique. An investigation was made of methods of attaining high temperatures by extracting energy from electrical plasma torches rather than by gaseous combustion which is the established technique. The theoretical considerations and practical efforts relating to the development of a functioning plasma torch are described. (Author)

AD-269 727 Div. 25
(TISTP/MFA) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
THE STABILITY OF THIN CONICAL FRUSTUMS SUBJECTED TO AXIAL COMPRESSION AND INTERNAL OR EXTERNAL UNIFORM HYDROSTATIC PRESSURE,
by Paul Seide. Mar 61, 29p. illus. tables, 6 refs. (Rept. no. 7102-0014-RU-000; EM 11-4)
(Contract AF 04(647)619)
(AFBMD TR 61-37) Unclassified report

DESCRIPTORS: (*Structural shells, Conical bodies, Stability, Hydrostatic pressure.) (*Load distribution, Deformation, Buckling, Mechanical properties.) (Equations, Experimental data, Tables.)

Calculations are presented for the problems of the stability of conical shells subjected to (1) combined external uniform hydrostatic pressure and axial tension or compression, and (2) combined internal uniform hydrostatic pressure and axial compression. The interaction curves for the first problem are found to depend on the ratio of the end radii of the cone and are bounded by the limiting curves for a cylinder and for a complete cone. The change of shape of the curves with varying end radius ratio is small, however. For the second problem the critical axial load of a pressurized cone is found to be greater than the sum of the critical axial load of an unpressurized cone and the pressure load on the small cross section. The difference is a function of the internal pressure and of the cone geometry. (Author)

AD-269 728 Div. 25
(TISTP/MFA) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
MAGNETIC SHIELDING FACTORS OF A SYSTEM OF CONCENTRIC SPHERICAL SHELLS,
by Felix Schweizer. Apr 61, 12p. incl. illus. 3 refs. (Rept. no. 7103-0015-RU-000)
(Contract AF 04(647)619)
(AFBMD TR 61-47) Unclassified report

DESCRIPTORS: (Magnetic materials, *Shielding, Magnetic fields, Spheres, Metals, *Structural shells, Magnetic susceptibility.) (Numerical analysis, Transformations (Mathematics), Harmonic analysis, Matrix algebra.)

General expressions are developed for the shielding factors of concentric spherical shells of linear isotropic magnetic material. Approximate results are given for shells of highly permeable material which are thin compared to their radii. (Author)

AD-269 730 Div. 25
(TISTP/TL) OTS price $9.60

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP.
Quarterly progress rept. no. 43.
15 Jan 62, 111p. incl. illus. tables, refs.
(Contracts Nonr-184134 and AF 19(604)8445)
Unclassified report

DESCRIPTORS: (*Solid state physics, *Molecular structure, Theory.) (*Wave transmission, Electrons, Atomic orbitals, Molecular rotation, Metals, Gallium, Water, Molecules, Energy, Scattering, Amplitude modulation, Brillouin zones, Hyperfine structure, Quadrupole moments, Tables, Perturbation theory.) (Equations, Integral equations, Integration, Integrals, Matrix algebra, Bessel functions, Green's function, Polynomials, Operators (Mathematics), Partial differential equations, Numerical methods and procedures.)

Contents:
The solid-state and molecular theory group
A configuration interaction study of the electronic states of the water molecule
Evaluation of molecular integrals
The electronic states of benzene
H2-H2 interaction
Symmetry and free electron properties of the gallium energy bands

APW program for gallium structure
Energy bands in nickel
Band calculations in Ge and Si
Energy bands in nickel oxide by augmented plane wave method
Two-electron Heisenberg exchange interaction between neighboring atoms
Perturbations in metals
Bound states in the spin wave problem
A relationship between the determinantal method and the method of fractional percentage coefficients

AD-269 731 Div. 25
(TISTP/MFA) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
HEAT DISSIPATION THROUGH DIODE LEAD WIRES UNDER STEADY-STATE CONDITIONS,
by W. D. Buckman. Oct 61, 20p. incl. illus. tables (Rept. no. TDR-930(2121)TN-1)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Heat transfer, Diodes, Wire, *Conductors, Nickel, Copper, Thermal conductivity, Electric connectors, Tests, Thermodynamics.) (Experimental data, Tables, Functions, Equations.)

Results of an investigation of the capabilities of wire leads to function as heat dissipating media are presented. Experimental work related to this project has confirmed that leads may serve as heat sinks to an extent greater than has generally been recognized, and has also served as a basis for derivation of the theoretical relationships which define the significant parameters involved. The experiments were conducted to generally determine the effects of varying wire lead materials, lengths, and diameters under both radiative and convective ambient conditions. The mathematical relationships which have been obtained provide quantitative methods for predicting the effect and behavior of component-generated heat on performance, and will permit better correlation between component wattage ratings as stated by the manufacturer and noted by the user. (Author)

AD-269 742 Div. 25
(TISTP/MS) OTS price $5.60

W. W. Hansen Labs. of Physics, Stanford U., Calif.
HIGH RESOLUTION CONTACT X-RAY MICROSCOPY,
by Howard H. Pattee. Dec 61, 36p. incl. illus. table, 44 refs. (Technical rept. no. 1; rept. no. 59)
(Contract Nonr-22542, Proj. NR 304-493)
Unclassified report

DESCRIPTORS: (*X rays, *Microscopy, Electron microscopy, Test methods, Effectiveness.)

Experiments on high resolution x-ray recording materials have shown that a great many possibilities exist for producing contact x-ray images which can be enlargedwith the electron microscope. Soft x-ray resolution of about 500 angstroms showed that exposure times for such images may be of the order of 10 minutes. The useful field of view may be of the order of 1000 times the minimum resolving distance. The experimental techniques have not yet been reduced to routine practice since almost all the work has been exploratory in nature serving only to demonstrate the possibilities of the general method. Although special instruments such as the microfluoroscope were used in much of the irradiation, it was also demonstrated that a slight modification of the electron microscope which is used to enlarge the x-ray images will also permit its use for the primary irradiation. Throughout the work an attempt was made to use only those specimen preparation and mounting techniques which are consistent with standard electron microscope procedures. (Author)

AD-269 757 Div. 25
(TISTA/SEB) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
LIQUID-GAS INTERFACE IN ZERO-G.
Final semiannual rept., 1 Jan-30 June 61, by L. van der Wal. 30 June 61, 15p. incl. illus. 4 refs. (Rept. no. 7230-0001-RU-000)
(Contract AF 04(647)619)
(BSD TR-61-15) Unclassified report

DESCRIPTORS: (*Liquids, Fluids, Surfaces with *Gases, Dynamics, Gravity, Acceleration, Weightlessness, Temperature, Pressure, Theory, Test equipment, Test methods.)

In the investigation of the behavior of a liquid-gas mixture in a zero-g field, an experiment unit was installed in an Atlas reentry nosecone test vehicle. The experiment unit houses a movie camera, placed so as to observe and record the interaction of gas and water contained in a plastic cube during the 25-minute near-zero-g conditions present on an ICBM flight. Temperature and pressure changes are also recorded. (Author)

AD-269 771 Div. 25
(TISTP/MFA) OTS price $1.60

University of Southern Calif. Engineering Center, Los Angeles.
LOW FREQUENCY RADIATION FROM AN ELECTRIC DIPOLE IN A COLD ANISOTROPIC PLASMA,
by Hans H. Kuehl. Nov 61, 10p. 1 ref. (USCEC rept. no. 79-204)
(Contract AF 49(638)522, Proj. 9768)
(AFOSR-1809) Unclassified report

DESCRIPTORS: (*Low frequency, *Electromagnetic waves, Electric fields, Dielectrics, Dipole moments.) (*Plasma physics, Electrons, Ions, High frequency, Plasma oscillations.)

Expressions for the electromagnetic radiation from anelectric dipole in an infinite cold anisotropic plasma are presented under the condition that the operatingfrequency is much less than the ion gyro frequency. It is found that the major portion of the radiation is concentrated along the direction of the magnetostatic field. (Author)

AD-269 797 Div. 25
(TISTP/TL) OTS price $2.60

AVCO Research Lab., Everett, Mass.
BASIC STUDIES IN MAGNETOHYDRODYNAMICS.
Final rept., 1 May 57-31 Oct 61, by Richard M. Patrick. 31 Oct 61, 28p. incl. illus. 17 refs.
(Contract AF 49(638)61, Proj. 9751)
(AFOSR-1782) Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Gas flow, *Magnetic fields, *Configuration, Drag, Lift, Electron beams, Electron guns, Hydrogen, Argon.) (*Plasma physics, Propulsion, Gas ionization, Exhaust gases, Velocity, Rockets, Heating, Specific impulse.) (*High temperature research, Shock tubes, Thermonuclear reactions, Electric power production, Heat exchangers, Infrared detectors, Measurement, Heat transfer, Shock waves.)

Research was directed toward obtaining a basic understanding of magnetohydrodynamics. The initial studies led to three possible applications for magnetohydrodynamics which in turn led to three categories of research. The first application appeared in connection with the problem of high-altitude, very high velocity flight which we call fight magnetohydrodynamics. The second application was plasma propulsion. The third category was the production of a very high temperature collision-free plasma. (Author)

AD-269 816 Div. 25, 9, 4
(TISTP/MFA) OTS price $10.10

AeroChem Research Labs., Inc., Princeton, N. J.
CONVECTIVE HEAT TRANSFER WITH CHEMICAL REACTION, I. THEORETICAL DEVELOPMENT OF CORRELATION FORMULAE FOR THE PREDICTION OF HEAT FLUXES IN HIGH PERFORMANCE ROCKET MOTORS AND RELATED SYSTEMS.
Interim technical rept. on Research on Combustion Kinetics,
by Daniel E. Rosner. Aug 61, 123p. incl. illus. tables, 129 refs.
(Contract AF 33(616)6216, Proj. no. 7013)
(ARL 99, pt. 1)
Unclassified report

DESCRIPTORS: (*Heat transfer, *Convection, Boundary layer, Gas flow, Chemical reactions, Thermochemistry, Thermodynamics, Rocket motors.) (Transport properties, Recombination reactions, Boundary layer, Gas flow, Hypersonic flow, Hypersonic nozzles.) (Dissociation, Combustion, Hydrogen, Oxygen, Diffusion.) (Experimental data, Tables.)

Energy transfer in chemically reacting boundary layer flows is discussed from the point of view of the investigator, who is seeking to extend existing correlation formulae to cases in which thermochemical effects influence heat transfer rates. Emphasis is placed on the prediction of convective heat fluxes in high performance rocket motors; however, examples are also taken from the field of hypersonic gas dynamics, as follows: the appropriate driving force for heat transfer with chemical reaction, effects of the enhanced efficiency of energy transport by diffusion as compared to ordinary conduction, calculation of the turbulent film conductance in axisymmetric nozzles, thermodynamic calculation of enthalpy/mixture-ratio charts for combustion gas mixtures, effects of chemical non-equilibrium in the gas phase, effects of surface catalyzed exothermic recombination reactions, extimation of transport properties in partially dissociated gas mixtures with emphasis on the binary diffusion coefficients pertaining to molecular fragments. (Author)

AD-269 831 Div. 25, 15
(TISTP/MFA) OTS price $3.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
USE OF THE DISCRETE ORDINATE METHOD FOR DESCRIBING THE TRANSPORT OF FAST NEUTRONS THROUGH IRON SLABS,
by R. H. Peterson and H. W. Ege. Oct 61, 39p. incl. illus. table, 3 refs. (BRL memo. rept. no. 1374)
(DA Proj. no. 503-04-004)
Unclassified report

DESCRIPTORS: (*Neutrons, *Transport properties, Transmission, Scattering, Reflection, Shielding, Metal plates, Iron, Absorption.) (*Numerical methods and procedures, Integral equations, Differential equations, Polynomials, Partial differential equations.) *Fast neutrons.

The use of the discrete ordinate method for solving a simplified form of the neutron transport equation as a semi-empirical description of dose transmission through iron slabs was investigated. The basic information to which the model was fitted consists of a detailed set of Monte Carlo results which takes into account the incident energy and direction, the slab thickness and the exit direction. For 0.16-Mev neutrons, the fit was found to be excellent in all respects. At energies of 0.85, 1.2, 2.0 and 4.0 Mev, the total dose transmission was found also to give a good fit but its angular density and the total dose reflection were somewhat in error. (Author)

AD-269 854 Div. 25
(TISTP/TL) OTS price $1.10

Plasmadyne Corp., Santa Ana, Calif.
NOTE ON THE AXISYMMETRY OF AN ELECTRODELESS DISCHARGE,
by H. G. Loos and R. P. Treat. Aug 61, 5p. illus. 2 refs.
(Contract AF 49(638)1014, Proj. 9751)
(AFOSR-1520)
Unclassified report

DESCRIPTORS: (*Electric discharges, *Magnetic fields, *Configuration, Vacuum systems, *Electric fields, *Coils.) (Gas ionization, Polarization, Electrons, Density, Ions, Vortices, Vector analysis.)

The vacuum electric field in a configuration is strongly non-axisymmetric, but the polarization of the gas inside the coil completely compensates the non-axisymmetric component, leaving an axisymmetric field. (Author)

AD-269 855 Div. 25
(TISTP/TL) OTS price $2.60

Group for the Advancement of Spectroscopic Methods (G.A.M.S.) (France).
THEORETICAL STUDY OF THE ANOMALOUS ROTATIONAL STRUCTURE OF LEVEL 0311 IN THE ROTATION-VIBRATION SPECTRUM OF C13 O162 ,
by G. Amat and M. H. Andrade E. Silva. 25 Jan 61, 14p. illus. 21 refs. (Technical note no. 1)
(Contract AF 61(052)369)
(AFCRL-809) Unclassified report

DESCRIPTORS: (*Molecular spectroscopy, Carbon, Oxygen, Isotopes, Molecules, *Quantum mechanics, Theory.) (Perturbation theory, Resonance, Nuclei, Magneto-optic rotation.) (Operators (Mathematics), Matrix algebra, Integral equations, Transformations (Mathematics), Numerical analysis, Partial differential equations.)

AD-269 857 Div. 25
(TISTP/TL) OTS price $4.60

Plasmadyne Corp., Santa Ana, Calif.
IONIZATION EXPERIMENT ON AN ELECTRODELESS DISCHARGE WITH TOROIDAL GEOMETRY,
by J. E. Chambers, H. G. Loos and other . Aug 61, 20p. illus.
(Contract AF 49(638)1014, Proj. 9751)
(AFOSR-1625) Unclassified report

DESCRIPTORS: (Gases, *Electric discharges, Ionization, Measurement, Magnetic fields, *Plasma physics, Electric fields, Discharge tubes.) (Gas ionization, Heating, Electrical conductance, Hydrogen.) (Instrumentation, Photographs, Photographic analysis, Oscillograms, Oscilloscopes, Collimators, Photomultipliers.) (Integration, Geometry.)

Measurements were made concerning the initial breakdown of a gas subjected to an electrodeless discharge in a toroidal geometry with the magnetic field in the longitudinal direction. The current through a ring conductor embracing the toroidal discharge tube established the rotational transform required for plasma equilibrium. Smear photographs of the discharge were made, looking through the discharge tube in a plane which passes through the torus axis. Simultaneous measurements of light intensity and of the magnetic field in the gas show that the initial breakdown occurs at a time when the magnetic field is zero. The data allow an interpretation in which the plasma has the form of a shell. Marginal breakdown conditions have been measured. (Author)

AD-269 864 Div. 25
(TISTP/MFA) OTS price $4.60

Instrument Corp. of Florida, Melbourne.
DESIGN CONSIDERATIONS OF A PHOTOSENSOR FOR THE DETECTION OF LIGHT FLASHES,
by James B. Willmann. 27 Nov 61, 41p. incl. illus. tables, 7 refs. (Scientific rept. no. 1)
(Contract AF 19(604)5967, Proj. 7600)
(AFCRL-62-200)
Unclassified report

DESCRIPTORS: (Light, Light transmission.) (*Optical equipment, *Photometers, Radiometers, Stroboscopes, Flash lamps.) (Detection, *Design, Theory, Geodesics.) (Electromagnetic waves, Wave transmission, Scattering, Absorption, Attenuation.) (Instrumentation, Optical systems, Photomultipliers.)

The theory and design of a photosensor to be used for the accurate timing of a missile or aircraft-borne stroboscopic light are presented. The precise determination of the flash times of the strobe is necessary for certain applications in geodesy and trajectory determination. Certain aspects of photometry and atmospheric phenomenon are reviewed to establish a solid framework upon which to base the design. The properties of the strobe light and background radiation are discussed and a basic design is developed. (Author)

AD-269 866 Div. 25, 19, 20
(TISTP/JW) OTS price $3.60

Coordinated Science Lab., U. of Illinois, Urbana.
(No title).
Progress rept. for Sep-Nov 61.
Nov 61, 27p. incl. illus.
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: (*Gyroscopes, Inertial navigation, Spheres, Beryllium.) (Physics, *Vacuum systems, Plasma physics, Electrons, Molecules, Helium.) (*Secondary emission, Gold, Molybdenum.) (*Nuclear resonance, Fluorescence, Copper.) (*Electrons, Diffraction, Crystals, Germanium.) (*Analog computers, Digital computers, Transistors, Computer logic, Programming.) (*Plasma physics, *Delay lines.)

AD-269 877 Div. 25
(TISTP/TL) OTS price $1.10

Israel Inst. of Tech., Haifa.
SHORT-RANGE ORDER STRENGTHENING IN A LONG-RANGE ORDERED PHASE,
by P. S. Rudman. July 61, 8p. illus. 8 refs.
(Scientific note no. 8)
(Contract AF 61(052)122)
(ARL-223) Unclassified report

DESCRIPTORS: (*Solid state physics, Iron, Aluminum, Brass, Alloys, Solids, Solutions, Atoms, Microstructure, Physical properties, *Shear stresses, Deformation.) (Fluid flow, Temperature, Measurement, Chemical bonds, Crystal structure, Lattices, Probability.)

The short-range order shear stress contribution is calculated for BCC structures using first approximation quasi-chemical theory. A maximum effect is obtained at the critical temperature. The short-range order contribution is compared with the contributions of mechanisms due to Sumino and to Brown. The separation of the short-range order and the Sumino contributions through their different temperature dependencies is discussed. (Author)

26. PRODUCTION AND MANAGEMENT

AD-269 136 Div. 26, 17
(TISTM/EJH) OTS price $2.60

Watertown Arsenal Labs., Mass.
WELDING LOW-CARBON MARTENSITE.
Report on Research of Metals and Nonmetallic Materials for Ordnance Construction,
by William P. Hatch, Roger E. Travis and Carl E. Hartbower. Dec 61, 19p. incl. illus. tables, 5 refs. (Technical rept. no. WAL TR 320.1/2)
(DA proj. 5B93-32-002)
Unclassified report

DESCRIPTORS: (*Steel, *Martensite, *Nickel alloys, *Welding, Welds, Welded joints, Mechanical properties, Tensile properties, Impact shock.)

Low-carbon martensites offer much promise as strong, ductile, tough and weldable materials for lighter-weight welded structures. In the 9% Ni steel investigated, yield and ultimate strengths on the order of 145,000 and 192,000 psi, respectively, with 56% reduction of area and good toughness were obtained. Although some reduction from the outstanding properties of the base metal occurred on welding, the strength and toughness of the welds remained at satisfactory levels so that low-carbon martensites could provide significant weight savings for many low-alloy high-strength steel structural applications. (Author)

AD-269 188 Div. 26, 17
(TISTM/EJH) OTS price $1.10

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF PROCEDURES FOR WELDING 2-INCH-THICK TITANIUM-ALLOY PLATE.
Bimonthly rept., 30 June-30 Nov 61,
by W. J. Lewis, G. E. Faulkner, and P. J. Rieppel. 30 Nov 61, 7p. incl. illus. tables.
(Contract NOw-60-0390-c)
Unclassified report

DESCRIPTORS: (*Titanium alloys, *Metal plates, *Arc welds, *Welds, *Welded joints, Wire, *Welding, Arc welding, Mechanical properties, Tensile properties, Fracture (Mechanics), Impact shock.) (Aluminum alloys, Tin alloys, Vanadium alloys, Niobium alloys, Submarine hulls.)

Three experimental filler materials were made and deposited in Ti-6Al-4V plate to obtain weld metals with high-impact properties. Weld metals made with one of the experimental filler materials (Ti-5Al-2Cb-1Ta) had the highest impact properties of any weld or base plate evaluated in this program. The impact properties were 50 ft-lb at room temperature and 44 ft-lb at -80 F. The yield strength of the weld made with this filler was 104,000 psi. The impact properties of the welds made with the other 2 experimental fillers (Ti-6Al and Ti-6Al-4V) were higher than the impact properties of the welds made with commercial filler wires. The experimenal fillers contained relatively low O contents and the welds made with these fillers contained considerably less O than the welds made with the commercial filler wire. Cracks were observed in a multipass Ti-5Al-2.5Sn weld made with matching filler wire. (Author)

AD-269 349 Div. 26, 17
(TISTM/TCG) OTS price $2.00

Brush Beryllium Co., Cleveland, Ohio.
FUSION WELDING OF BERYLLIUM.
Final rept., 1 May 59-31 Aug 60, on Metallic Materials.
by B. M. MacPherson and W. W. Beaver. Apr 61, 63p. incl. illus. tables.
(Contract AF 33(616)6413, Proj. 7351)
(WADD TR 60-917) Unclassified report

DESCRIPTORS: (*Beryllium, *Beryllium alloys, Wire, *Arc welding, Arc welds, Welding, Welds, Melting, Processing, Manufacturing methods.) (Grains (Metallurgy), Deformation, Thickness, Tensile properties, Mechanical properties, Fracture (Mechanics), Heat treatment.) (Metals, Oxides or Metal coatings, Additives.)

The standard conditions used for fusion welding of Be are given. Studies of the effects of post-heat treatment and fixturing on fusion welds are reported, along with limited studies of miltiple-pass welding and fillet welding of Be. The effects of residual impurities on the weldability of Be are discussed relative to the Be filler wire development phase. Drawn Be welding wire was coated with Cu, Ag, Au, Ni, Fe, Co, Sn, Cr, Zn, and Cd; the effects of these coated wires upon the fusion weld properties of Be are described. (Author)

AD-269 355 Div. 26, 12
(TISTW/EET) OTS price $4.60

Lycoming Div., AVCO Mfg. Corp., Stratford, Conn.
GROUND SUPPORT EQUIPMENT. FIGURE A (HARDENED AND DISPERSED) (801 - 999). MINUTEMAN RE-ENTRY VEHICLE. MARK 5 MOD 3.
10 Feb 61, 1v.
(Contract AF 04(647)667)
Unclassified report

DESCRIPTORS: (Records of *Ground support equipment, *Maintenance equipment, Maintenance tools for Handling and Shipping and Maintenance of *Re-entry vehicles.)

AD-269 367 Div. 26, 15
(TISTP/MFA) OTS price $1.60

Columbia U. School of Engineering, New York.
INSPECTION-MAINTENANCE-REPLACEMENT SCHEDULES UNDER MARKOVIAN DETERIORATION,
by Morton Klein. 1 Dec 61, 16p. 6 refs.
(Technical rept. no. 14)
(Contract Nonr-26655)
Unclassified report

DESCRIPTORS: (*Management engineering, *Reliability, Quality control, Sampling, *Scheduling, Statistical analysis, Probability, Costs, Linear programming, Linear systems.)

It is assumed that an inspection is capable of supplying more information about a system's condition than just whether it is operative or inoperative. Specifically, our assumption is that the deterioration of the system can be described as a discrete time, finite Markov chain and that the inspection procedure is capable of detecting which state the system is in at the time it takes place. Repairs, if made, can put the system in one of many possible states, the as new state being only one of the available alternatives. The purpose was to show, for an average cost per unit time criterion function, that the problem of finding an optimal inspection-repair-replacement policy can be formulated in linear programming terms. (Author)

AD-269 505 Div. 26, 17
(TISTM/BRW) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF 2400 DEGREE F FORGING DIE SYSTEM.
Interim technical progress rept., 28 Sep-27 Dec 61,
by H. Nudelman, A. H. Murphy and others.
Jan 62, 17p. incl. illus. tables.
(Contract AF 33(600)42861, Proj. 7-886)
(ASD TR 7-886, vol. 3) Unclassified report

DESCRIPTORS: (*Forging, *Dies for Molybdenum alloys, Refractory materials, Metals, Ceramic materials, Intermetallic compounds, Cermets, Design.) (Manufacturing methods, *Extrusion, High temperature research, Plastic flow, Plasticity, Deformation, Stresses, Oxidation.) (Production, Airframes, Guided missiles.) (Dies, Materials, Heat resistant alloys, Nickel alloys, Chromium alloys.) (Refractory coatings, Metal coatings.)

Efforts were continued on extending hot forging die technology to refractory metals. A hot die system to evaluate the upper operating temperature limit of Inconel 713 C forging dies is ready for forging. Redesigned dies are partially prepared to use a hot die extrusion - forging process to minimize the forging sequence. High-temperature properties of metallic, intermetallic and nonmetallic materials are being determined to assess their utility as 2400 F forging dies. (Author)

AD-269 555 Div. 26, 30
(TISTP/MFA) OTS price $5.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE PERFORMANCE OF INFORMATION PROCESSING EQUIPMENT OR AN INDUSTRIAL APPLICATION OF THE ANALYSIS OF VARIANCE TO DATA ON THE PERFORMANCE OF THREE BRANDS OF LONG-WEAR MAGNETIC TAPE AND TWO CHANNELS AND FOUR TAPE DRIVES OF THE I. B. M. 7090,
by H. P. Hartkemeier. Oct 61, 45p. incl. illus. tables (Rept. no. 5-11-61-1)
Unclassified report

DESCRIPTORS: (*Tests, *Data processing systems, Magnetic tape, *Feasibility studies, Reliability, Quality control.) (Research program administration, Design.) (Numerical analysis, Analysis of variance.)

Three brands of long-wear magnetic tape were tested. The criterion for evaluating performance was the number of error stops encountered in testing the entire tape on each reel during the first run. The analysis of variance with four criteria of classification and equal frequencies within cells revealed that there is a significant difference in performance among brands. Although the evidence of this difference is reliable, the classification of reels by brands is the least important by the four used. The use of a guaranteed reel rather than a standard stock reel accounted for the greatest amount of variance, approximately 13 times as much variance as the brands. The two types of error stops accounted for over 7 times as much variance as the brands. Two groups of tape drives accounted for almost 3 times as much variance as the brands. The statistical analysis of variance revealed that the ranking of the brand depends heavily upon the other factors. The significant two-way and three-way interactions were interpreted, and three-dimensional illustrations were presented to give a visual, geometrical interpretation of these interactions or joint effects of two and three factors in the analysis of variance. (Author)

AD-269 564 Div. 26, 15
(TISTP/MFA) OTS price $11.00

New York U. Coll. of Engineering, N. Y.
SYNTHESIS OF LINEAR CONTROL SYSTEMS WITH LOW SENSITIVITY TO PLANT VARIATIONS.
Doctoral thesis,
by Paul E. Fleischer. May 61, 147p. incl. illus. 35 refs. (Technical rept. no. 400-31) (Contract AF 49(638)586, Proj. 9768)
Unclassified report

DESCRIPTORS: (*Control systems, Linear systems, Synthesis, *Processing, Sensitivity, Feedback, Design.) (*Numerical analysis, Partial differential equations, Polynomials, Sampling, Probability.) (*Instrumentation, Noise.) (Theses, *Bibliography.)

A study of the design of linear control systems insensitive to plant variations is presented. Linear feedback systems, characterized by no direct transmission to the output and plants which have only a single input and a single output, are considered. In such systems, the degree of insensitivity, (with respect to plant variations), that can be achieved is limited by three factors. These are the noise generated by the measuring instrument, possibility of plant saturation, and non-minimum phase zeros of the plant. Methods for specifying a system's sensitivity function in the presence of these conflicting requirements are derived. The results are also of value in establishing and limiting the fundamental capability of a passive-adaptive control system to minimize the effects of plant variations. This is of importance if the use of adaptive control is contemplated. Such control is often difficult to implement and is slow in adjusting to the changing environment. For these reasons it should not be used unless a clear superiority over insensitive (i.e., passive-adaptive) systems can be demonstrated. (Author)

AD-269 616 Div. 26
(TISTM/TCG) OTS price $16.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
FLUX EQUIPMENT FOR AUTOMATIC AND SEMIAUTOMATIC WELDING (Flyusovaya Apparatura Dlya Avtomaticheskoy Polyavtomaticheskoy Svarki),
by A. I. Chvertko. 24 Aug 61, 210p. incl. illus. tables, 103 refs. (Trans. no. MCL-924/1 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moskva, 153p., 1960)
Unclassified report

DESCRIPTORS: (*Welding fluxes, *Industrial equipment for Automatic, *Welding, Preparation, Processing, Physical properties, Mechanical properties, Test methods, Specifications, Mathematical analysis, Manufacturing methods.) (Transportation, Conveyors, Hydraulic pressures, Theory.) *USSR.

Contents:
General information on flux equipment
Theory and calculation of pneumatic transportation
Initial magnitudes for calculating flux equipment
Comparative analysis of the operation of flux apparatus of various systems
Calculation of flux equipment
Contemporary flux equipment
Utilization of flux equipment in industry
Testing, mounting, exploitation and repair of flux equipment

AD-269 618 Div. 26
(TISTM/TCG) OTS price $6.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PRESS FORGING EQUIPMENT (Kuznechno-Pressovoye

Oborudovaniye)
by Ye. P. Unksov and B. V. Rozanov. 3 Aug 61, 66p. incl. illus. tables, 6 refs. (Trans. no. MCL-926/1 of Mashgiz. Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moskva, 55p., 1960)
Unclassified report

DESCRIPTORS: (*Forging, *Machines, *Forge presses, Metal forming presses, Metal forming brakes, Production, Processing, Manufacturing methods, *Industrial equipment.) (Hammers, Extrusion, Rolling mills.) USSR.

Contents:
Developmental trend of press-forging machine construction
Equipment for stamping of sheet parts
Mechanical hot punching and stamping presses
Forging rollers
Horizontal-forging and electric upsetting machines
Drop hammers
Power screw presses
Hydraulic stamping presses
Presses for extrusion
Hydraulic forging presses
Specialized rolling mills

AD-269 647 Div. 26
(TISTM/LH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ACCELERATING THE BUILDING OF NEW MACHINES,
by V. P. Butusov. 22 Aug 61, 20p. incl. illus. (Trans. no. MCL-1269/1 of Nauchnye Doklady Vysshey Shkoly, Mashinostroyeniye i Priborostroyeniye 3:15-24, 1958)
Unclassified report

DESCRIPTORS: (*Industry, *Machines, *Industrial research, *USSR, Scientific research, Manufacturing methods, Analysis.)

AD-269 699 Div. 26, 30, 32
(TISTP/MFA) OTS price $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
A DUAL DECOMPOSITION PRINCIPLE,
by C. E. Lemke and T. J. Powers. 4 Dec 61, 15p. 14 refs. (RPI Math rept. no. 48)
(Contract Nonr-59113)
Unclassified report

DESCRIPTORS: (*Scheduling, *Linear programming, Digital computers, Management engineering, Production, Economics, Reliability.) Operations research.

A decomposition principle for linear programming is presented. The technique may be viewed as a dual of the Dantzig - Wolfe decomposition principle for linear programs. The program matrix in what we may call the basic problem is considered as having many (an infinite number of) columns. One visualizes a basic problem, in primal form, where, the set of permissible columns is not finite, as in the usual primal form, but is a given convex polyhedron. The basic problem is solved by the modified simplex method, but at each iteration the column to enter the current basis emerges as the solution to an auxiliary linear program and is, in fact, an extreme point of the given convex polyhedron. (Author)

AD-269 761 Div. 26, 17, 27
(TISTM/GEC) OTS price $1.60

Titanium Metals Corp. of America, Toronto, Ohio.
DEVELOPMENT OF FINE DIAMETER, HIGH STRENGTH Ti-13V-11Cr-3Al WIRE.
Final rept.,
by E. Bohanek. 15 Nov 61, 14p. incl. illus. tables.
(Contract NOw 60-0188)
Unclassified report

DESCRIPTORS: (*Wire, *Titanium wire, Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, Processing, Pickling, Tests, Tensile properties, Mechanical properties, Production, Manufacturing methods.) (Rocket cases, Filament wound construction.)

The results indicate that 0.004in diameter Ti-13V-11Cr-3Al wire can be produced to ultimate strength levels of about 285 Ksi. Occasionally, the 300 Ksi ultimate tensile strength objective was met, but not predictably. To realize the maximum strength, it has been found necessary to acid pickle 5 to 10% from the diameter of the heat treated final product. Twelve pounds of 0.004in diameter wire was produced in a 23,000 foot continuous strand. It is believed that 8,000 foot minimum lengths can be guaranteed for this product and that with further process development, the 300 Ksi ultimate tensile strength aim could be exceeded. (Author)

AD-269 789 Div. 26, 17
(TISTM/BRW) OTS price $1.10

Science and Tech. Branch, Aerospace Information Div., Washington, D. C.
JOINING OF SAP (SINTERED ALUMINUM POWDER).
14 Dec 61, 3p. incl. illus. (AID rept. 61-166 of Spot and Seam Welding of SAP; Svarochnoye Proizvodstvo 11:7-10, Nov 61 and Brazing of Svarochnoye Proizvodstvo 11:10-13, Nov 61)
Unclassified report

DESCRIPTORS: (Powder metals, *Aluminum, *Spot welding, *Brazing, Welded joints, Soldered joints, Sheets, Films, Oxides, Surface properties, Coatings, Metal coatings, Aluminum alloys, Manganese alloys, Effectiveness and Mechanical properties of Metal joints.) (USSR, Powder metallurgy.) (Soldering alloys, Zinc alloys.) (Tin coatings, Melting, Controlled atmospheres, Argon, Electric arcs, Electric welding, Resistance, Zinc alloys, Copper alloys, Aluminum alloys.)

AD-269 808 Div. 26, 14
(TISTM/TCG) OTS price $1.10

Aerospace Information Div., Washington, D. C.
AUTOMATION OF THE SOVIET RUBBER INDUSTRY.
21 Dec 61, 4p. 8 refs. (AID rept. 61-171)
Unclassified report

DESCRIPTORS: (*Synthetic rubber, *Industrial plants, USSR, Automation, Test methods, Control, Computers, Production, Manufacturing methods.)

A program aimed at automatic control of operations at synthetic-rubber plants currently being conducted by the Voronezh Branch of the Specialized Design Bureau for Automatic Equipment (OKBA) is described. The account includes an interpretation of requirements for over-all automation, for the development of techniques of automatic control and regulation, and for the application of computer technology to the rubber-production process. (Author)

27. PROPULSION SYSTEMS

AD-269 184 Div. 27, 25
(TISTA/SEB) OTS price $1.60

Aerospace Corp., El Segundo, Calif.
ON-OFF PULSED TRANSMISSION LINE FOR PLASMA PROPULSION,
by Allan B. Schaffer. 8 Mar 61, 8p. incl. illus. (Rept. no. TDR-594(1214-01)TN-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Electric propulsion, Ion rockets, Plasma physics, *Plasma jets, Plasma oscillations, Magnetohydrodynamics, Magnetic pinch, Theory, Mathematical analysis.)

Huddleston's analysis of on-off pulsed operation of the rail plasma driver is extended to the transmission line-type plasma driver. Both the mode of operation in which the distributed capacitors of the transmission line are originally uncharged and the one in which they are originally charged are analyzed. Theoretically on-off pulsed operation affords the possibility of achieving high efficiencies with either mode of operation. From a practical standpoint, however, the mode with capacitors originally uncharged is seen to be the most feasible. (Author)

AD-269 189 Div. 27, 10
(TISTA/SEB) OTS price $1.10

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Bimonthly progress rept. no. 5,
by W. L. Streets. 7 Dec 61, 4p. illus. 4 refs.
(Research Division rept. no. 3056-61R)
(Contract NOw 61-0590-d)
Unclassified report

DESCRIPTORS: (*Turbojet engines, Duct inlets, Guide vanes, Reliability, Corrosion by Sulfur and Sea water, Tests.) (Combustion chambers, Combustion chamber liners, Shielding, Thermal radiation, Corrosion, Erosion from Flames, Combustion chamber gases, Tests.) (Hydrocarbons, Jet engine fuels.)

The effects were studied of sulfur in jet fuels and ingested sea water on the durability of turbine inlet guide vanes. Efforts included evaluation of the effect of sea water and the combined effects of sulfur and sea water and preparation toward utilization of the Phillips Microburner, a bench-scale atmospheric pressure laboratory combustor, in future metal corrosion tests as a supplement to the work planned for the Phillips 2-Inch Combustor. The results of tests on sea water alone and in combination with fuel sulfur are inconclusive as a result of marked increases in corrosion of components upstream of the guide vane test pieces. Metallic ash fragments from these components may have coated the guide vane pieces and protected them from attack. An investigation of the reasons for the sharp increase in flame tube and radiation shield corrosion with test vanes is in progress. (Author)

AD-269 196 Div. 27, 11, 14
(TISTM/EJH) OTS price $10.10

Bendix Products Div., Bendix Corp., South Bend, Ind.
MATERIALS PROPERTY DATA.
Quarterly progress rept. no. 3 on Phase 1, 1 Oct-31 Dec 61,
by James W. Yates. Jan 62, 1v. incl. illus. tables.
(Contract AF 33(616)8086)
Unclassified report

DESCRIPTORS: (Friction brakes, *Brake linings, Materials, Metals, Alloys, Additives, Graphite, Aircraft.) (Tests, Test equipment, Test facilities, High temperature research.) (Erosion, Deposits.) (*Rocket motors, *Rocket motor nozzles, Materials, *Refractory materials, Insulating materials, Thermal insulation, *Refractory coatings, Cermets, Ceramic materials, Silicon compounds, Beryllium compounds, Zirconium compounds, Magnesium compounds, Oxides, Tungsten, Steel, Tungsten alloys, Molybdenum alloys, *Graphite, Heat resistant polymers.)

Contents:
High temperature - high friction materials
Lining compositions
Procedures
Data
Rocket motor material evaluation
Test facilities
Jet piercing torch data
Final report on 20 firings on 3.75 in. Rocket
Data from 10 firings on 3.75 in. Rocket
Final report on 10 firings on 5.75 in. Rocket
Data from 7 firings on 5.75 in. Rocket

AD-269 242 Div. 27
(TISTA/LH) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
HOT GAS SERVOMECHANISM THEORY AND TECHNOLOGY: AN ANNOTATED BIBLIOGRAPHY,
comp. by Eugene E. Graziano. Oct 61, 22p.
(Special bibliography no. SB-61-57; Rept. no. 3-80-61-34)
(Contract NOrd-17017)
Unclassified report

DESCRIPTORS: (*Bibliography, *Servomechanisms, Servo systems, *Pneumatic servomechanisms, Pneumatic systems, Gas generating systems.)

A selected list of annotated references is presented on hot gas servomechanisms including design, analysis, components, and experience. Some references are to classified reports with unclassified titles, and these are not annotated so that this bibliography may be more widely circulated. Selected items in related areas, such as pneumatics, are included. (Author)

AD-269 336 Div. 27, 14, 26
(TISTM/TCG) OTS price $1.10

Aerojet-General Corp., Azusa, Calif.
DEVELOPMENT OF IMPROVED HIGH-STRENGTH PREIMPREGNATED MATERIALS FOR FILAMENT-WOUND ROCKET MOTOR CASES.
Informal progress rept. no. 4, 1 Oct-30 Nov 61. 18 Dec 61, 6p. incl. illus. tables (Rept. no. L0525-01-4)
(Contract NOw-61-0642-c)
Unclassified report

DESCRIPTORS: (*Rocket cases, *Filament wound construction, Materials, Tensile properties, Combustion chambers, Tests, Processing, High pressure research, High temperature research.) (Fibers, Filaments, Glass textiles, Binders, Resins, Heat resistant polymers, Impregnation.)

Test were made on experimental glass for both dry glass and pre-preg for Lot 1 and the control glass Lot 37. Lots 1 and 3 of experimental glass had strand tensile strengths of over 340,000 psi, which is more than 10% higher than for the control glass. NOL-ring and chamber test results were about the same for both pre-preg and dry-glass versions of the experimental and control glasses. (Author)

AD-269 345 Div. 27, 12
(TISTA/SEB) OTS price $9.60

Aerojet-General Corp., Azusa, Calif.
PRODUCTION AND DELIVERY OF MODEL AJ10-101a PROPULSION SYSTEM FOR ABLE-5 PROGRAM.
Final rept., 29 Feb 60-15 Feb 61,
by Eli Bail and Hugh R. Wahlin. Apr 61, 1v. incl. illus. tables, 8 refs. (Rept. no. 1948)
(Contract AF 04(647)285)
Unclassified report

DESCRIPTORS: (Space probes, Lunar probes, Liquid rocket propellants, *Rocket motors, Design, Tests, Flight testing.) (Nitric acid, Methyl hydrazines.)

Efforts to provide a liquid rocket propulsion system for the second stage of Atlas-Able 5 are summarized. The two firings of the motor were unsuccessful although all systems demonstrated their ability to function separately in flight environment. The general propulsion system, Pjo transducer, thrust chamber gimbal monoball, actuator lugs, gimbal actuation system, electrical system, and structural supports of the system are described. A description of the test support equipment and the test methods is included.

AD-269 387 Div. 27, 10
(TISTA/SEB) OTS price $10.50

General Electric Co., Cincinnati, Ohio.
OBSERVED EMISSIVITIES OF ROCKET COMBUSTION GASES.
Final rept.,
by D. E. Robison and S. J. Van Grouw. Dec 61, 132p. incl. illus. tables, 15 refs.
(Contract AF 49(638)413)
(AFOSR-1904) Unclassified report

DESCRIPTORS: (Rocket motors, Liquid rocket propellants, Combustion, *Combustion chamber gases, *Exhaust gases, Pressure, Temperature, *Thermal radiation, Infrared radiation, Infrared spectroscopy, Detection, Measurement, Tests, Theory, Mathematical analysis.) (Nitric acid, Ammonia, Hydrazines, Nitrogen compounds, Tetroxides.) (Test equipment, Infrared detectors, Thermopiles, Detectors.) (Test methods, Spectrographic analysis.)

The total and the spectral intensity of the radiation emitted by rocket combustion products at high pressure was studied. Spectral and total radiation data are presented for 3 rocket propellant systems: HNO_3 and HN_3; N_2O_4 and NH_3; and N_2O_4 and N_2H_4. Each of the combinations contained H_2O as the principal radiating gas. The measurements were made at a nominal combustion pressure of 700 psia. Emissivity correlations and methods of estimating the temperature of the combustion gases are developed. A technique is given for obtaining direct observation of high temperature gases inside the combustion chamber of a small rocket motor.

AD-269 388 Div. 27, 7, 21
(TISTA/VGW) OTS price $2.60

General Electric Co., Schenectady, N. Y.
ELECTRIC PROPULSION SYSTEMS. APPENDIX 1.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by B. D. Bedford and G. W. Kessler. Oct 61, 22p. incl. illus.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Submarine engines, Main propulsion plants, *Electric propulsion, Underwater propulsion, *Nuclear propulsion, Electric machinery, Direct current, Alternating current, Design, Configuration, Effectiveness, Maintenance, Reliability, Submarine noise.)

A detailed discussion of one phase of the Low Maintenance Machinery Study program is presented in support of the final report (AD-327 314). Direct current-, alternating-, and acyclic-electric motor systems were considered. (Author)

AD-269 389 Div. 27
(TISTW/JRG) OTS price $1.60

General Electric Co., Schenectady, N. Y.
TURBO-ELECTRIC MAIN PROPULSION AND AUXILIARY POWER PLANT, APPENDIX 2.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by R. J. Hooker. Oct 61, 7p. incl. illus.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Submarines, Main propulsion plants, Ship turbines, Steam power plants, Auxiliary power plants, *Submarine engines, Direct current, *Generators, Design.)

A newly developed generator called the Acylic generator is discussed. It is a low voltage-high current dc generator. A turbo-generator power plant using this acylic generator and including a 4000 KW auxiliary generator is shown. It is pointed out that an acylic generator can be used in a submarine for main propulsion power, but to fulfill the requirements of the Low Maintenance Machinery project, a design study should be initiated to unearth every fact of its design, construction, application and operation. (Author)

AD-269 390 Div. 27, 21
(TISTA/VGW) OTS price $4.60

General Electric Co., Schenectady, N. Y.
MAIN PROPULSION STEAMOTOR APPENDIX 3.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by R. J. Hooker. Oct 61, 51p. incl. illus.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Submarine engines, Main propulsion plants, *External combustion engines, Steam power plants, Theory, Design.) Underwater propulsion, *Nuclear propulsion.

A study made of the problems of integrating the steam engine into a submarine is presented. A high-performance steam engine design is proposed with modifications that can be done to the design to alleviate most of the objections. This study used the aircraft engineers' approach of

using the radial engine configuration, with a master and link rod connecting rod. In addition, the philosophy of water-lubricated bearings is utilized as the basis of the several designs that are believed to have the most merit. The possibility is shown of consolidating the engine, condenser, boiler feed pump and lubricating water pump into one package. Included in this study were barrel engines, incorporating several designs of the slider or cam drives; and, while they look attractive, it was felt that the technical problems were too overpowering to continue giving them much consideration. (Author)

AD-269 391 Div. 27, 21
(TISTA/LSK) OTS price $1.10

General Electric Co., Schenectady, N. Y.
POWER CONTROL OF THE DOUBLE-ACTING STEAMOTOR. APPENDIX 4.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by F. J. Neugebauer. Sep 61, 5p.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*External combustion engines, Power, Control, *Control systems.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

Consideration was given to Steamotor control by (1) variable cut-off, and (2) throttling. (Author)

AD-269 392 Div. 27, 21
(TISTA/LSK) OTS price $1.10

General Electric Co., Schenectady, N. Y.
FORCE AND TORQUE VARIATIONS OF THE DOUBLE-ACTING STEAMOTOR, APPENDIX 5.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by F. J. Neugebauer. Sep 61, 8p. incl. illus.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*External combustion engines, Torque, Moments, *Dynamics.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

AD-269 393 Div. 27, 21
(TISTA/LSK) OTS price $2.60

General Electric Co., Schenectady, N. Y.
HYDROSTATIC WATER LUBRICATION OF STEAMOTOR, APPENDIX 6.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by E. B. Arwas. Oct 61, 26p. incl. illus. tables.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*External combustion engines, Gas bearings, Journal bearings, Bearings, Water, *Lubricants, Lubrication, *Hydrostatic pressure, Design, Feasibility studies.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

Hydrostatic water lubrication of bearings of the Steamotor is being considered, as an alternative to oil lubrication. The feasibility of hydrostatic water lubrication of the Steamotor bearings is studied from the standpoints of the supply pressure, flow and power required to carry the design loads. In addition, the ability of the bearings to withstand high magnitude, short duration shock loads is investigated. (Author)

AD-269 394 Div. 27, 21
(TISTA/LSK) OTS price $3.60

General Electric Co., Schenectady, N. Y.
HYDRAULIC TORQUE CONVERTER, APPENDIX 7.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by F. M. MacDonald. June 61, 39p. incl. illus. tables.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (Transmission, *Automatic transmissions, Design, Feasibility studies.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

The use of the torque converter principle in marine propulsion transmission was investigated. This included scaling an existing design by laws of similitude (with two unit compounding for high speed ratio), torque converter compounded with gearing, and single unit torque converter design with axial flow components for high speed ratio. CONCLUSIONS: (1) no existing single unit torque converter design will meet the reduction ratio requirements of 15 or 25 to 1 at practical efficiency levels; (2) to meet required speed ratio, it is necessary to compound two units of existing design, compound one torque converter unit with single gear reduction, and design a new torque converter unit with pump and turbine elements adapted to high speed ratio; and (3) high speed ratio torque converter designs involve high flow, low head, and high relative flow velocities, leading to high fluid friction losses and tendency to cavitate. (Author)

AD-269 395 Div. 27, 21
(TISTA/LSK) OTS price $7.60

General Electric Co., Schenectady, N. Y.
HYDROKINETIC TRANSMISSION, APPENDIX 8.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by D. W. Craft. Aug 61, 70p. incl. illus. tables.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (Transmissions, *Automatic transmissions, Configuration, Power, Control, Control systems, Design.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

This report is an extension of Interim Report II (DF61AT711) and it investigates methods of varying the power output of a hydrokinetic transmission at constant speed input with minimum loss in efficiency. The report also presents methods of obtaining astern power by the use of thrust reversers in the propeller system. CONCLUSIONS: The torque converter transmission with a variable geometry pump rotor is the most satisfactory transmission for

obtaining power control with constant input speed from the point of view of efficiency. This type of transmission requires some innovations for providing reliable methods for attachment and adjustment of the pump rotor blades. Thrust reversers in the propeller stream have the greatest promise for a reliable method of producing reversing power. (Author)

AD-269 396 Div. 27, 21
(TISTA/LSK) OTS price $4.60

General Electric Co., Schenectady, N. Y.
LIQUID SHEAR TRANSMISSION, APPENDIX 9.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by F. J. Neugebauer and B. Sternlicht. Oct 61, 47p. incl. illus. tables.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Transmissions, *Torque couplings from Shear stresses, Torque of Liquids, Hydraulic fluids, Hydraulic gear fluids, Elasticity, Hydrodynamics.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

It appears that a liquid shear transmission can be developed, however, its reliability is questionable in the 15,000 hp range. The minimum film thickness is of the order of 10 times 10 to the-6th power inches. Any dirt, thermal or pressure distortions would effect the performance of this transmission. Fluid shear transmissions in the order of hundreds of horsepower are quite feasible and reliable. The weight of this type of transmission is quite low. (Author)

AD-269 397 Div. 27, 21
(TISTA/LSK) OTS price $1.60

General Electric Co., Schenectady, N. Y.
COMPACT POWER PLANTS, APPENDIX 10.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by R. J. Hooker. Nov 61, 14p. incl. illus.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Steam turbines, Generators, Steam power plants, Configuration, Design.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Electric propulsion, Ship turbines, Submarines.)

A 15,000 hp power plant was reduced in envelope volume by consolidating and integrating every component. The design incorporates the newer technologies of the steam and water lubricated bearings, improved condenser tube configurations, high-performance boiler feed water pumps, canned generator stator, and rotor components. (Author)

AD-269 398 Div. 27, 21
(TISTA/LSK) OTS price $1.60

General Electric Co., Schenectady, N. Y.
EVALUATION OF SUBMARINE POWER TRANSMISSIONS, APPENDIX 11.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by H. Stern. Oct 61, 12p. incl. illus. tables.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Transmissions, *Automatic transmission, *Torque couplings, Design, Feasibility studies, Configuration.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Electric propulsion, *External combustion engines, *Steam turbines, Generators, Submarines.)

The evaluation of transmission systems for steam-powered submarines is summarized. Following a more detailed investigation of certain types of fluid transmissions, all information available on mechanical, fluid, and electrical transmissions was collected. The merits of each of 31 transmissions and comparison with the systems design goals reduced the field to 4 transmissions. It can be concluded that the direct coupled steam turbine is the only presently feasible transmission system which meets the reliability, maintenance, and noise requirements prescribed in this program. The steam motor direct drive is superior to the steam turbine because of its considerable weight advantage. Third place in the lineup of feasible transmissions can go to either hydraulic or electric transmissions dependent mainly on the weight vs efficiency criteria imposed on the system. (Author)

AD-269 399 Div. 27, 21
(TISTA/LSK) OTS price $1.60

General Electric Co., Schenectady, N. Y.
FLUID TRANSMISSIONS, APPENDIX 12.
Progress rept. on Low Maintenance Machinery for Submarine Power Plants,
by H. Stern. July 61, 18p. incl. illus. table.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Transmissions, *Automatic transmissions, Design, Feasibility studies.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Submarines.)

AD-269 400 Div. 27, 21
(TISTA/LSK) OTS price $2.60

General Electric Co., Schenectady, N. Y.
APPRAISAL OF VARIOUS MECHANICAL TRANSMISSIONS, APPENDIX 13.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by H. Stern. Oct 61, 21p. incl. illus. table.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Transmissions, Automatic transmissions, Torque couplings, External combustion engines, Steam turbines, Generators, Main propulsion plants, Submarine engines, *Nuclear propulsion, Underwater propulsion, Electric propulsion, Marine propellers, Variable pitch propellers, Submarines.)

An appraisal is made of various mechanical means of transforming thermal power into hydraulic power, i.e., steam energy into ship thrust. The steam motor direct drive for a propeller makes a very attractive transmission. It is being explored in detail under a separate phase of the program. The torque converter development could result in substantially improved propulsion systems with either turbine or reciprocating steam prime movers. Other mechanical transmission

schemes which were investigated include: (1) Hydraulic split transmissions using both hydrokinetic and hydrostatic elements; (2) Belt drives; and (3) Variable pitch propellers. Hydrodynamic shear drives are being evaluated separately. Of the transmission currently thought feasible, the Fottinger transformer and the steam motor direct-drive offer the greatest incentive for further investigation. (Author)

AD-269 401 Div. 27, 7, 21
(TISTA/LSK) OTS price $3.60

General Electric Co., Schenectady, N. Y.
CONDENSER ANALYSIS, APPENDIX 14.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by F. J. Neugebauer. May 61, 33p. incl. illus. tables, 2 refs.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (Steam turbines, Generators, Ship turbines, Steam power plants, *Steam condensers, Condenser tube expanders, Configuration, Design.) (*Nuclear propulsion, Electric propulsion, Main propulsion plants, Submarines.)

AD-269 402 Div. 27, 21
(TISTA/LSK) OTS price $4.60

General Electric Co., Schenectady, N. Y.
MACHINERY SYSTEMS AND CONTROL CONSIDERATIONS, APPENDIX 15.
Rept. on Low Maintenance Machinery for Submarine Power Plants,
by D. H. Brown. Dec 61, 47p. incl. illus. tables.
(Contract Nonr-348500)
Unclassified report

DESCRIPTORS: (*Control systems, Pneumatic systems, Hydraulic systems, *Servomechanisms, *Electric servomechanisms, *Hydraulic servomechanisms, *Pneumatic servomechanisms, Pressure regulators, *Valves, *Control valves, Safety valves, Thermostatic valves, *External combustion engines, *Steam turbines, Generators, Maintenance, Reliability, Design, Feasibility studies.) (Main propulsion plants, Submarine engines, Underwater propulsion, *Nuclear propulsion, Electric propulsion, Submarines.)

Consideration is given to equipment and procedures that will provide submarine machinery for propulsion, auxiliary, and hotel service that will be characterized by: (1) low maintenance afloat; (2) reduce surveillance afloat; (3) fail-sick in place of fail-dead characteristic; (4) reduced man-hours and down time for most probable service; (5) reduced skillto operate, supervise, trouble-shoot, and replace; (6) reduced apparent complexity thru packaged components and functions; (7) enhanced efficiency to prolong cruises; and (8) capability to operate at all speeds at all depths and under high shock loads. (Author)

AD-269 483 Div. 27, 1
(TISTA/VGW) OTS price $5.60

Fram Corp., Providence, R. I.
FABRICATION AND FIELD EVALUATION OF A HIGH-CAPACITY, HIGH-EFFICIENCY CHARGE AIR FILTER SYSTEM FOR ARMY AIRCRAFT. PHASE II. EVALUATION OF H-23C ENGINE AIR AND LUBE OIL FILTER SYSTEM BY RADIOACTIVE TRACER TECHNIQUES.
Final rept. on Phase 2,
by J. W. Jackel. Nov 61, 51p. incl. illus. tables.
(Contract DA 44-177-tc-495, Proj. 9R38-01-017-45)
(TREC TR 61-127) Unclassified report

DESCRIPTORS: (*Air intake filters, Oil filters for *Helicopter engines, Flight testing with Labeled substances, Radioactive isotopes for Abrasion, Effectiveness.)

This report covers the design, development, and field testing of a high-capacity, high-efficiency air filter for application on light aircraft engines. Radioactive tracer techniques were employed and a mobile gamma radiation scintillation spectrometer circuit utilized for rapid wear analyses in flight tests. The top piston ring of one cylinder of a H-23C helicopter engine was irradiated by neutron bombardment, and its wear measured when the engine was protected with various filters and also with no filter in the induction system. A reduction in piston ring wear by a factor of three was noted when the engine was protected with a high-capacity, high-efficiency air filter to one that had no filters. (Author)

AD-269 569 Div. 27, 17, 14
(TISTM/EJH) OTS price $3.60

Little, Arthur D., Inc., Cambridge, Mass.
DEVELOPMENT OF PYROLYTIC REFRACTORY MATERIALS FOR SOLID-FUEL ROCKET MOTOR APPLICATIONS.
Quarterly status rept. no. 1,
by Ronald Francis. 10 Oct 61, 38p. incl. illus. 9 refs.
(Contract DA 19-020-ORD-5490, Proj. TB4-004)
(WAL TR 766.41/2)
Unclassified report

DESCRIPTORS: (Rocket motors, *Rocket motor nozzles, Solid rocket propellants, Materials, *Refractory materials.) (*Graphite, Alloys, Boron alloys, Molybdenum alloys, Tungsten alloys, Tantalum alloys, Chromium alloys, Manganese alloys, Titanium alloys, Silicon alloys, Microstructure, Physical properties, Density.) (Manufacturing methods, Vaporization, Methanes, Benzenes, Metalorganic compounds, Metallic compounds, Metallic smoke deposits.) Test methods.

Investigations were made of the preparation and evaluation of refractory metal alloys of pyrolytic graphite as a function of source gas concentration, flow rate, and deposition temperature to optimize the structural performance of the products in high-temperature erosive environments. In each system analogous reaction conditions are found to be operative and microstructural, and other physical aspects similar to those of pyrolytic graphite are observed. Carbide formation and other disadvantageous aspects of the vapor deposition processes are considered. Initial studies of the materials in oxidizing atmospheres are described. (Author)

AD-269 658 Div. 27, 12, 14
(TISTM/BRW) OTS price $8.10

High Temperature Materials, Inc., Boston, Mass.
PYROLYTIC CARBIDE DEVELOPMENT PROGRAM.
Final rept., 15 Mar 60-30 Sep 61,
30 Sep 61, 54p. incl. illus. tables, 6 refs.
(Contract NOw 60-0292)
Unclassified report

DESCRIPTORS: (*Rocket motor nozzles, Refractory coatings of *Carbides from Pyrolysis of Hydrocarbons and Tantalum compounds, Hafnium compounds, Niobium compounds, Chlorides on Graphite, Structures, Nozzles.) (Tests, Failure (Mechanics), Thermal expansion, Thermal stresses.) (Erosion, Inhibition.)

Refractory pyrolytic carbides were investigated as erosion resistant barriers on the surface of rocket nozzles, specifically for Polaris nozzles with advanced propellants. A mixture of reactant gases composed of a metal halide and a hydrocarbon was developed for coatings of TaC, HfC and NbC on graphite substrates. High density, single phase, impervious carbide coatings were produced which are intimately bonded to their substrate. Special graphites are required with coefficients of thermal expansion compatible with the carbides. Pyrolytic TaC- and NbC-coated rocket nozzle inserts resisted erosion. Partial failures, in term of removal of the coatings in the exit cone section of the nozzles, appeared to be caused by thermal stresses or from structural changes in the substrate material. Thermal shock does not appear to be a problem when these coatings are employed. The feasibility of producing full scale rocket nozzles with surface coatings of pyrolytic carbides was also demonstrated. (Author)

AD-269 662 Div. 27, 22
(TISTW/JRG) OTS price $2.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
HAZARD CLASSIFICATION TEST OF CARTRIDGE-ENGINE STARTER, MC-1, MC-2, MXU-4/A (AMOCO) AND MXU-4/A (OLIN MATHIESON),
by James L. Higgins. Jan 62, 21p. incl. illus.
(Rept. no. OOY TR 62-1)
Unclassified report

DESCRIPTORS: *Jet engines, *Airplane engine starters, *Starter cartridges, Ammonium radicals, Nitrates, Propellants, Explosives, Detonation, Hazards, Combustion, Storage, Shipping, Classification, Tests.

Five detonation tests were conducted on each of the 4 types of cartridges to determine if a detonation would occur and if so, would the detonation propagate from cartridge to cartridge. One cartridge in a shipping container (cardboard box) was primed with 30 grains of tetryl and initiated with an Engineer Special blasting cap. Each type of cartridge was also subject to a cook-off test. No detonations occurred in any of the tests. The MC-1 and MC-2 primed cartridges were ruptured and threw burning propellant within a 10-ft radius. The remains of the cartridge cases also remained in this area. HE MXU-4/A cartridges did not ignite as the primer charge could not be placed on the propellant grain. All of the cartridges cooked-off between 10 and 15 min after the scrap lumber was ignited. It was concluded that all of the cartridges tested were quantity distance class 2, storage compatability group J and ICC shipping class C. (Author)

AD-269 679 Div. 27, 17, 26
(TISTM/BRW) OTS price $11.50

Pratt and Whitney Aircraft, East Hartford, Conn.
RESEARCH AND DEVELOPMENT OF TITANIUM ROCKET MOTOR CASE.
Quarterly interim technical rept. no. 5, 1 July-30 Sep 61,
by R. P. Brody and W. E. Helfrich. 31 Oct 61, 77p. incl. illus. tables.
(Contract DA 19-020-ORD-5230, Proj. TB4-004)
(Rept. no. WAL TR 766.2/1-4)
Unclassifiedreport

DESCRIPTORS: (*Rocket cases, *Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys.) (Mechanical properties, Manufacturing methods, Sheets, Rolling mills, Aging, Forging, Welding, Electron beams, Heat treatment, Machining.) (Crystal structure, Grains (Metallurgy), Impurities, Hydrogen, Oxygen, X-ray diffraction analysis.) Tensile properties.

The sustained notched tensile strength of cold-rolled and aged sheet stock at the 180,000 psi yield strength level was lower in the -35 F to 200 F temperature range for a H content of 70 than for 200 ppm; strengths were equivalent at 400 F. Press-forged pancakes with a 0.15%-O content were capable of attaining the 200,000 psi yield strength level by direct aging at 900 F. Multiple-pass tungsten inert gas (TIG) welding produced no improvement in notched tensile strength or toughness as compared with the single-pass method despite reduced grain size and increased bend ductility; electron-beam welding yielded slight improvements as compared with TIG welding. Closed-die press forging of subscale 14-in.-diam domes by the pancake and preform technique at 1650 F and 1700 F produces superior tensile ductility at the 180,000 psi yield strength level as compared with similar forging at 1850 and 2000 F. (Author)

AD-269 712 Div. 27, 9, 25
(TISTP/WH) OTS price $1.60

RAND Corp., Santa Monica, Calif.
AN ADIABATIC-ISOTHERMAL NOZZLE,
by V. F. Stepanchuk, tr. by Joy B. Gazley.
Dec 61, 10p. 3 refs. (Rept. no. RM-2930-PR)
(Trans. from Inzhenerno-Fitzicheskii Zhurnal (Journal of Engineering Pysics) vol. 2, pp. 66-71, 1959)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: (*Nozzles, Design, *Adiabatic gas flow, Mathematical analysis, Numerical methods and procedures, Equations of state, Thermodynamics.) (*Adiabatic gas flow, *Compressible flow, Thermal expansion, Heat of reaction, Equations of state.) Aerodynamics, USSR.

A method is presented for the nozzle calculation for a chemically active flow at a constant static temperature. (Author)

AD-269 767 Div. 27
(TISTA/SEB) OTS price $9.10

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
CESIUM ION PROPELLANT SYSTEM.
Final rept., Mar 60-Oct 61,
by Donald R. Snoke and Patrick J. Lawlor.
29 Dec 61, 89p. incl. illus. tables (Rept. no. ER-4636)
(Contract AF 33(616)7219, Proj. 3084)
(ASD TR 61-662) Unclassified report

DESCRIPTORS: (Rocket motors for *Electric propulsion, *Ion rockets, Gases, Ions, Magnetohydrodynamics, Design, Military requirements, Materials, Tests.) (*Cesium, Storage, Handling, Vaporization, Heating, Temperature control, Pressure.)

The cesium ion propellant system consists of the hardware necessary to store, meter, vaporize, and superheat cesium to allow delivery of this vapor at the flow rate, pressure, and temperature consistent with the requirements of contact ion propulsion devices now under investigation. Presented are the results of compatibility and handling studies for cesium, design, and development of separate system components, and integration of the components into a laboratory system including the results of a one week endurance test. (Author)

AD-269 815 Div. 27
(TISTA/SEB) OTS price $16.00

Airesearch Mfg. Co., Phoenix, Ariz.
AERODYNAMIC CRITERIA FOR OPTIMUM DESIGN OF MIXED-FLOW IMPELLERS-FINAL EVALUATION.
Final technical rept. on Mechanics of Flight, by Jules L. Dussourd. Sep 61, 227p. incl. illus. tables, 16 refs.
(Contract AF 33(616)2940, Proj. 7063)
(ARL TR 60-317)

Unclassified report

DESCRIPTORS: (*Impellers, *Mixed flow compressor, High pressure compressor, High pressure compressor blades, Pressure, Transonics, Configuration, Aerodynamics, Design, Theory, Mathematical analysis, Tests.)

Effort was made to establish aerodynamic design criteria for high-pressure-ratio, transonic, mixed-flow impellers. Results are given on two impellers. For each impeller extensive amounts of inlet and exit survey data, as well as shroud and over-all data, are presented and discussed. The boundary layer development was studied along the blade surface for several impellers at several speeds. Results are compared with over-all impeller measured performance. The study provides quantitative means of evaluating blade loadings and provides some insight as to the distribution of the losses and the magnitude of the viscous clogging allowance. An evaluation is made of design procedure in the light of test results. A comparison and correlation of the results for all impellers is made so as to formulate design criteria. A rational approach is developed, aimed at minimizing centrifugal impeller and diffuser losses. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-269 043 Div. 28, 16, 22
(TISTB/LH) OTS price $4.60

Human Engineering Labs., Aberdeen Proving Ground, Md.
A PILOT STUDY OF TEMPORARY THRESHOLD SHIFTS RESULTING FROM EXPOSURE TO HIGH-TENSITY IMPULSE NOISE.
by M. Glenn Smith and Gerald Goldstone. Sep 61, 37p. incl. illus. tables, 8 refs. (Technical memo. no. 19-61)

Unclassified report

DESCRIPTORS: (*Noise, Auditory signals, Hearing, *Auditory thresholds, Auditory acuity, Sensitivity, Hazards.) (Military personnel, *Human engineering.) (Ordnance, Weapons.)

This investigation was a pilot study to determine the temporary threshold shifts resulting from exposure to high-intensity impulse noise. The threshold shifts induced were of a temporary nature, i.e., there were no instances of permanent hearing losses along any of the experimental subjects. The purpose was to explore various physical parameters of a sound source and relate them to any decrements they may have on auditory acuity. Thirty enlisted men received audiometric tests both before and after exposure to a high-intensity impulse noise generated by an M-14 rifle. Rate and number of impulses were varied separately and examined at three test frequencies. Due to inter-subject differences, only general implications are indicated. Recommendations are included for future research. (Author)

AD-269 068 Div. 28, 16
(TISTB/MS) OTS price $16.50

Naval Medical Field Research Lab., Camp Lejeune, N. C.
A FACTOR ANALYSIS OF PERSONNEL SELECTION DATA: INTRA- AND INTER-AREA RELATIONSHIPS OF BIOCHEMICAL, PHYSIOLOGICAL, PSYCHOLOGICAL, AND ANTHROPOMETRIC MEASURES.
by Ellsworth B. Cook. Dec 61, Vol. 11, no. 26, pp. 1-398, incl. illus. tables, 60 refs.
(Proj. MR005.14-2101)

Unclassified report

DESCRIPTORS: (*Naval personnel, *Military personnel, *Selection, Tests.) (*Factor analysis, Biochemistry, Physiology, Physical fitness, Psychology, Anthropometry, Data.)

Tests used in routine screening, together with special additional measures, were administered to 120 randomly selected enlisted submarine candidates under carefully controlled conditions. The 362 variables included data from the biochemical, psychological, psychiatric, physiological, anthropometrical, and physical examination fields. Data for the various area studies are appended in sufficient detail to permit additional investigations by interested specialists. These include material on the biochemistry of nervous stability; co-relational relationships of the various white blood cells in healthy male adults; physical fitness, anthropometric and somatotyping measures; two independent scorings of the Rorschach ink-blot test; personal interviews given each subject separately by two interviewers, and several psychological tests employed in selection. (Author)

AD-269 103 Div. 28
(TISTB/CCH) OTS price $5.60

Rutgers U., New Brunswick, N. J.
HOMEOSTASIS THEORY OF SMALL GROUPS. VI. VOLUNTARY ORGANIZATIONS.
by F. Kenneth Berrien and Bernard P. Indik. Dec 61, 26p. incl. tables, 2 refs. (Technical rept. no. 8)
(Contract Nonr-40410)

Unclassified report

DESCRIPTORS: (*Group dynamics, *Social communication, *Adjustment (Psychology), Selection, Mathematical prediction.) (Behavior, Theory.)

Several techniques were used to take measurements of twelve relatively unconstrained groups (volunteer fire companies) with reference to Group Need Satisfaction (G.N.S.), Formal Achievement

(F.A.), Adjustability and selected predictor variables. Homeostatic theory was tested with reference to these groups. Hypothesis One: If G.N.S. and F.A. are at a high and approximately equally balanced level, an externally unconstrained group will persist in its existence over a period of time and be capable of adjusting itself to changes or disturbances imposed on it. The converse was also hypothesized. Supporting evidence for this hypothesis was found in this study. Hypothesis Two: Predictors of G.N.S., F.A. and Adjustability compensate among themselves to maintain each of these group criteria within limits. Evidence with reference to this hypothesis was mixed. The results supported the idea that these variables operated within predefined limits; however, the evidence for the compensatory operation of the predictors was mixed. (Author)

AD-269 109 Div. 28, 15
(TISTB/CCH) OTS price $3.60

Rutgers U., New Brunswick, N. J.
A TECHNIQUE FOR THE LONGITUDINAL STUDY OF GROUP STABILITY AND ITS APPLICATION TO GROUP HOMEOSTASIS,
by Bernard P. Indik. Dec 61, 34p. incl. tables, 13 refs. (Technical rept. no. 9)
(Contract Nonr-40410)

Unclassified report

DESCRIPTORS: (*Group dynamics, *Social communication, *Labor, Measurement.) Statistical analysis, Sociometrics, Probability, Matrix algebra.

In the study of the concept of homeostasis, as applied to on-the-job work groups, two statistical techniques were developed. These techniques were designed to detect changes of rate and pattern of communication interaction in these groups. The Activity Difference Coefficient showed the differences in the rate of communication, while the Configural Difference Coefficient showed the differences in the pattern of communication. Two shifts of men, identical in function but differing in number, were observed during their lunch and coffee break periods over consecutive sequences of time to test 3 general hypotheses: (1) adjustments of a system to disturbances are detectable through changes in the rate and/or pattern of communication interaction; (2) if no disturbances occur within the system, any changes in the rate or pattern of interaction communication may be considered random; (3) the patterns of work relationships and work flow control the configuration of off-the-job social interactions during work hours. The usefulness of these statistical techniques of matrix measurement was demonstrated and all 3 major hypotheses were partially supported by the data. (Author)

AD-269 146 Div. 28
(TISTB/LH) OTS price $2.60

Arizona State U., Tempe.
ONGOING VISUAL MONITORING: PROCEDURES FOR EXPERIMENTAL ANALYSIS AND CONTROL. PART I - MACHINE DEFINITION OF ONGOING SILENT AND ORAL READING RATE. PART II - A MULTI-PURPOSE PERCEPTUAL DEVICE,
by Israel Goldiamond. 1961, 19p. incl. illus. 14 refs.
(ESD TR 61-22) Unclassified report

DESCRIPTORS: *Reading, Behavior, Visual perception, Effectiveness, Test equipment, Monitors, Motion picture projectors.

Procedures for controlled alteration and definition of ongoing reading are presented. Reading not only has intrinsic interest, but can also be considered as a form of visual monitoring of a complex display, in which the behaviors required have linear sequences. A page is projected on a screen, with the subject required to read aloud, or silently. Through the same optical system, an opaque loop is projected. A transparent slit on the opaque loop exposes part of a line; with each frame, the slit moves linearly and sequentially exposing successive reading material. Recycling of the loop triggers off presentation of another page. Control of each frame of the loop is by the subject, who presses a micro-switch to advance the frame, thereby explicitly defining a reading response. The procedure is sensitive to variables such as signal-noise ratio, item difficulty, transient and long-term effects, pay-offs (contingencies) attached to responding, age. Procedures are suggested for training subjects to be differentially attentive to different parts of a display. Commercially available equipment is discussed which can be used for scheduled presentation and control of responses in the major psychophysical methods, for both human and animal monitoring research. (Author)

AD-269 266 Div. 28
(TISTB/MS) OTS price $2.60

North Carolina State Coll., Raleigh.
A MEDIATION MODEL FOR PAIRED-ASSOCIATE LEARNING,
by Slater E. Newman. Sep 61, 29p. illus. 39 refs. (Technical rept. no. 1)
(Contract Nonr-48608)

Unclassified report

DESCRIPTORS: (*Learning, Conditioned reflex, Transfer of training.) (*Verbal behavior, Reaction (Psychology).)

A model to explain how paired-associates get learned has been presented. It was proposed that paired-associate learning may involve as many as five interdependent processes corresponding to stimulus-term discrimination, response-term discrimination, response learning (for stimulus terms as well as for response terms), and an association stage. The model appears to be useful in interpreting data from studies dealing with the effects of context elements, of stimulus-term and response-term familiarization, of stimulus-term and response-term pronunciability, of terms with double function, and of the greater S-R than R-S strength following paired-associate learning. Some further implications of the model for paired-associate learning, serial learning, and transfer experiments were discussed and the need for additional study of mediating responses was emphasized. (Author)

AD-269 314 Div. 28
(TISTB/MS) OTS price $3.60

Virginia U., Charlottesville.
EXPERIMENTS IN VERBAL BEHAVIOR. II. THE REINFORCEMENT OF LINGUISTIC STRUCTURES USING AN ELECTRONIC VOICE OPERATED RELAY. I. METHODOLOGICAL CONSIDERATIONS,
by Arthur J. Bachrach and William T. Ross, Jr. Oct 61, 38p. incl. illus. 30 refs.
(Contract Nonr-4748)

Unclassified report

DESCRIPTORS: (*Verbal behavior, Language, Test methods, Conditioned reflex.) (*Voice communication systems, Electronic equipment, Circuits.)

Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

AD-269 332 Div. 28
(TISTW/EET) OTS price $15.50

American Inst. for Research, Pittsburgh, Pa.
GUIDE TO DESIGN OF MECHNICAL EQUIPMENT FOR MAINTAINABILITY.
Rept. on Human Performance in Advanced Systems, by James W. Altman, Angeline C. Marchese and Barbara W. Marchiando. Aug 61, 226p. incl. illus. tables, refs.
(Contract AF 33(616)6124, Proj. 7184)
(ASD TR 61-381) Unclassified report

DESCRIPTORS: (Design of *Maintenance equipment and *Ground support equipment for *Maintenance personnel.) (Air force equipment, Maintenance tools, Maintenance equipment, Ground support equipment, Maintenance, Maintenance personnel, *Human engineering.)

A guide containing human engineering recommendations and suggestions for designing mechanical equipment to increase over-all ease, speed, and accuracy of maintenance job performance is presented. It is written for engineers responsible for designing mechanical subsystems and components and is intended to serve as a convenient reference to help insure the integration of maintainability design into mechanical subsystems and components. It treats both design features common to all mechanical equipment as well as features unique to certain classes of equipment. (Author)

AD-269 490 Div. 28
(TISTB/MS) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
PEER RATINGS: A NOTE ON THE UNRATED CASES, by Richard E. Doll. 24 Oct 61, 3p. incl. table, 7 refs. (Special rept. no. 61-11)
Unclassified report

DESCRIPTORS: (*Group dynamics, *Leadership, Naval personnel, *Sociometrics.)

Most peer rating formats require the rater to nominate a specified number of his group members to the top and bottom positions in the group in terms of some particular trait or ability. When these nominations are pooled, there are frequently members of the group who are not named as either high or low (unrated group). The usual procedure has been to assign an average (i.e. mean) score to such individuals. However, it seems possible that, for the prediction of many criteria, the fact that a man was unrated might indicate something quite different from averageness. Peer ratings of leadership potential have been shown to correlate with subsequent success in the Naval Air Training Program. This study investigates the assumption of the averageness of this unrated group by comparing their later success with that of men who received the average score because of having received equal numbers of high and low nominations (rated group), and with that of men who received scores at levels other than average. The results indicate that the unrated group are not inferior to those men who were rated average, nor to the average of the total group in performance on the criterion used. (Author)

AD-269 527 Div. 28, 23
(TISTB/MS) OTS price $1.10

Personnel Lab., Aeronautical Systems Div., Lackland Air Force Base, Tex.
DEVELOPMENT OF THE AIR FORCE PRECOMMISSION SCREENING TEST-62,
by Lonnie D. Valentine, Jr. Oct 61, 5p. 2 refs.
(Proj. 7717)
(ASD TN-61-146) Unclassified report

DESCRIPTORS: (*Aviation personnel, *Navigators, Selection, Training.) (*Aptitude tests, Design.) Statistical analysis.

The 1962 revision of the Air Force Precommission Screening Test replaces an earlier form for screening of applicants for navigator training and selection of airmen for the Air Force Academy Preparatory School. Sections of the test were constructed as short equivalent forms of five parts of the Air Force Officer Qualifying Test: verbal, quantitative, general science, mechanical, and scale reading. Results of a tryout of the new test with a high-aptitude sample of basic airmen demonstrated a suitable distribution of scores and high correlations between corresponding parts of the new test and AFOQT. (Author)

AD-269 589 Div. 28, 18
(TISTB/CCH) OTS price $2.60

Research Center for Group Dynamics, U. of Michigan, Ann Arbor.
THE EFFECTS OF FEEDBACK AND GROUP TASK. DIFFICULTY ON INDIVIDUAL AND GROUP PERFORMANCE, by Robert B. Zajonc. 15 Nov 61, 26p. incl. illus. tables, 4 refs. (Technical rept. no. 15)
(Contract Nonr-122434)
Unclassified report

DESCRIPTORS: (*Group dynamics, *Job analysis, Effectiveness, Feedback, Labor.) Sociometrics, Mathematical analysis.

This experiment was concerned with the effects of feedback and group task difficulty on the performance of individuals working in seven men teams and on group performance. The results indicate that the performance of individuals improve when they work on a group task, and that the most pronounced improvement occurs for a difficult group task when information about the performance of all team members as well as of the team as a whole is made available. When information about team performance alone (confounded feedback) is given only slight improvement occurs. Group task difficulty led to increments in individual and group performance, although these increments were relatively weaker than those due to feedback. It was incidentally found that individuals performing at high rates were more sensitive to feedback than to group task difficulty, while the opposite was found for group members performing at low rates. (Author)

AD-269 666 Div. 28
(TISTB/MS) OTS price $2.60

Ohio State U., Research Foundation, Columbus.
SINGLE-VOWEL INTELLIGIBILITY TESTS, by Henry M. Moser, Wallace C. Fotheringham and Robert C. Henderhan. Mar 61, 23p. incl. tables, 7 refs. (Technical rept. no. 66)
(Contract AF 19(604)6179)
(AFESD TN 61-39) Unclassified report

DESCRIPTORS: (*Verbal behavior, *Intelligibility, Tests.) (*Vocabulary, *Language, Analysis.)

Intelligibility studies were made on (1) an expanded single-vowel word list composed of different beginning and ending consonants and consonantal combinations present in the language; (2) syllabic lists derived from word-halves of the same vowel list; and (3) PB words in which the most frequently occurring consonants and vowels in the language are represented. Results of the study indicated that (1) an expanded single-vowel list of 52 items can be constructed to represent 90 per cent of the total population of English monosyllables (1159 items) formed with this vowel; (2) the expanded single-vowel list is much more difficult than the PB list; (3) syllabic lists and the PB list are not highly related as indices of intelligibility; and (4) syllabic lists are reasonably accurate predictors of consonantal errors in words of which they are a part. (Author)

AD-269 720 Div. 28
(TISTB/MS) OTS price $2.60

Illinois U., Urbana.
GROUP AND ORGANIZATIONAL FACTORS INFLUENCING CREATIVITY.
Annual rept. 15 Nov 60-15 Nov 61,
by Fred E. Fiedler, Lawrence M. Stolurow and Harry C. Triandis. 15 Nov 61, 25p. incl. tables, 2 refs.
(Contract Nonr-183436)
Unclassified report

DESCRIPTORS: (*Group dynamics, Personality, Behavior, *Leadership, Attitudes, Effectiveness, Tests.) (*Stress (Psychology), Training.)

AD-269 860 Div. 28, 5
(TISTB/MS) OTS price $4.60

Georgia U., Athens.
THE CONSTANT-RATIO RULE AND VISUAL DISPLAYS,
by Milton H. Hodge, Morris J. Crawford, and Mary L. Piercy. Dec 61, 40p. incl. illus. tables, 15 refs. (Scientific rept. no. 2)
(Contract AF 19(604)7299)
(ESD TDR 61-56)
Unclassified report

DESCRIPTORS: (*Visual perception, *Display systems, Reaction (Psychology), Intelligibility, Position finding, *Statistical analysis.) (*Visibility, *Visual thresholds, *Space perception, Brightness.) Information theory.

Three experiments involving a simple recognition task were designed to evaluate a model of choice behavior, the constant-ratio rule. The stimulus objects consisted of a set of circles which varied in area or brightness. The experiments also examined the effects of practice, interstimulus spacing, and stimulus range on the predictions of the rule. The results indicated that the rule predicts reasonably well the responses to single dimensional displays of visual area and brightness. However, it was also found that the predictions are sensitive to variations in practice, interstimulus spacing, and task difficulty. (Author)

AD-269 886 Div. 28
(TISTB/AW) OTS price $1.10

Maryland U., College Park.
CODING AND USE OF INFORMATION IN PROBLEM SOLVING.
Progress rept., 1 Feb 61-31 Jan 62,
by Murray Glanzer. 31 Jan 62, 5p.
(Contract DA 49-007-md-1004)
Unclassified report

DESCRIPTORS: (*Coding, *Learning, *Memory, *Verbal behavior, Electroencephalography, Visual perception, Psychology.)

Progress is reported on the study of the information-processing aspects of problem solving and related aspects of verbal learning and retention. Studies were directed toward the measurement and control of factors that determine the difficulty of storage and processing of information during problem solving. Work has also begun on the EEG correlates of problem solving. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-269 520 Div. 29, 23
(TISTB/CCH) OTS price $1.25

Clark, David, Co., Inc., Worcester, Mass.
INTEGRATION OF PERSONAL EQUIPMENT.
Rept. for Mar 59-Apr 61, Oct 61, 33p. incl. illus.
(Contract AF 33(616)6444, Proj. 6325)
(ASD TR 61-524) Unclassified report

DESCRIPTORS: (*Pneumatic life rafts, *Protective clothing, *Survival, Aviation personnel, Effectiveness, Feasibility studies, Sea rescue equipment.) Survival kits, Clothing, Helmets, Pressure suits.

This report describes the various efforts, methods of approach and solutions to some problems of integrating items of air crew personal equipment. The major problems of integration is the combining of the various individual items, which have specific functions with each other, without complicating these combinations beyond their effectiveness limits. Practical solutions were achieved in some areas but additional work is required in others. (Author)

AD-269 772 Div. 29
(TISTB/MS) OTS price $1.10

Marine Corps Development Center, Quantico, Va.
CAMOUFLAGE CLOTHING FOR RECONNAISSANCE PERSONNEL.
Final rept.
19 Jan 62, 7p. incl. illus.
(Proj. 42-58-01J)
Unclassified report

DESCRIPTORS: (*Camouflage clothing, Naval personnel, Design, Tests.)

The prototype Reconnaissance Jackets M-2, were tested by the 2d Force Reconnaissance Company during extensive amphibious operations at St. Thomas, Virgin Islands during the period 6 October - 10 November 1961. Results indicate that the modifications incorporated into the M-2 jacket as a result of the initial tests have now rendered the jacket a useful item that is a substantial improvement over the camouflage utilities now in use. (Author)

AD-269 824 Div. 29, 14, 1
(TISTA/VGW) OTS price $6.60

Arrowhead Products, Long Beach, Calif.
COCKPIT RETENTION AND PARACHUTE SUSPENSION GARMET.
Final engineering rept.,
by George Huettl. 27 Oct 61, 60p. incl. illus. table.
(Contract NOw 60-0053)

Unclassified report

DESCRIPTORS: (*Flight clothing, Parachute fabrics, Safety harness, Elastic webbing, Nylon, Nets for Load distribution of Acceleration, Stresses on Pilots, Aviation personnel, Aviation safety, Tests, Design.)

Cockpit retention and parachute suspension flight clothing which can distribute high acceleration forces over large areas of the body was studied to reduce injuries occurring in present day high performance aircraft. It was found that a flexible, inelastic nylon-netting garmet could be utilized in distributing acceleration loads over the body torso. By crossing the fibers of a material over each other and biasing them at 45 degrees to the external load, a Chinese finger grip containment action can be developed. This containment action (axial compression load) is applied when acceleration forces are applied to the cockpit seat or the risers. Several restraint garmets were constructed for evaluation. Hip and shoulder restraint straps were integrated into the netting pattern for attachment to the risers and cockpit seat. The final garmet had a cover and liner for additional comfort and ease of donning and doffing. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-269 031 Div. 30
(TISTE/CRJ) OTS price $1.10

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
ELECTROMAGNETIC VACUUM BALANCE,
by A. S. Mikulinskiy and P. V. Gel'd. Dec 61, 8p. incl. illus. (Technical notes no. FRL TN 54; Trans. from Zavodskaya Lab. 9:921-922, 1940)
Unclassified report

DESCRIPTORS: (*Balances, *Electromagnets, Vacuum systems, USSR, Design.) (*Electrical networks, Circuits, Variable resistors, Galvanometers, Solenoids.)

The design and operation of an electromagnetic vacuum balance are described. This balance has been used successfully in the study of the kinetics of high temperature processes. (Author)

AD-269 046 Div. 30, 6
(TISTE/CDM) OTS price $10.50

Hallicrafters Co., Chicago, Ill.
HANDBOOK OF OPERATIONS AND SERVICE INSTRUCTIONS FOR TEST SET, ELECTRONIC CIRCUIT, PLUG-IN UNIT QRC-133A(T).
30 Nov 61, 125p. incl. illus. tables. (Contract AF 33(600)40992)
Unclassified report

DESCRIPTORS: (Handbooks, *Instruction manuals, *Test sets, *Radar jamming, *Radar equipment.) (Test equipment, Electronic circuits, Maintenance, Operation.)

Instructions are given for the operation and maintenance of test set electronic circuit, plug-in unit QRC-133A(T). This unit is designed to test the following modules of barrage jammer QRC-133A(T): (1) power supply; (2) voltage regulator; (3) modulator-power supply; and (4) interference generator. The outputs of these modules are displayed on various meters and indicators contained in this test set. The displayed outputs are evaluated to determine the performance of the module under test. To obtain significant test results and readings when testing the 4 modules of the QRC-133A(T) system, it is necessary to maintain the same conditions under which the modules under test normally operate. During normal operation in the QRC-133A(T) system, each of the 4 modules interacts in some way with at least one other module. The output of each module is affected by inherent loads in the associated modules. (Author)

AD-269 053 Div. 30
(TISTB/LH) OTS price $1.60

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
AUTOMATIC DATA PROCESSING SYSTEM MINIMAL INFORMER.
Quarterly progress rept. no. 9, June-Aug 61 on Design and Development of a Minimal Informer Engineering Test Model,
by Gilbert O. Boehm, Robert F. Keating and others. 31 Aug 61, 12p. incl. illus. (Contract DA 36-039-sc-78220, Proj. 3-B-28-02-001-01)
Unclassified report

DESCRIPTORS: (*Data processing systems, Data storage systems, Magnetic tape, Automatic, Design, Test equipment, Tests.)

Progress is reported on the design evaluation and testing in each of the areas of the Minimal INFORMER System. Further details are available in the Preliminary Design Plan and the addendum for the DC/R equipment, the Final Design Plan, and the Maintenance and Operational Manuals of the Minimal INFORMER System. (Author)

AD-269 055 Div. 30, 12, 6
(TISTA/VGW) OTS price $1.10

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PROBLEMS OF SPACECRAFT SCIENTIFIC INSTRUMENT CALIBRATION AND SYSTEMS TESTS,
by Raymond L. Heacock. Mar 61, 6p. incl. illus. tables (Technical rept. no. 32-73) (Contract NASw-6)
Unclassified report

Presented at the ARS Missile and Space Vehicle Test Conference, March 13-16, 1961, Los Angeles.

DESCRIPTORS: (Guided missile research, *Spaceships, Lunar probes, Space probes, Electronic equipment, *Flight instruments, Detectors, Ground support equipment, Instrumentation, Calibration, Test sets, Test equipment.)

The increasing number of complex scientific experiments being flown on JPL-NASA spacecraft for the exploration of the Moon, the planets, and interplanetary space is complicating the calibration and systems test problems associated with preparation and launching processes. The approaches to these problem areas are inadequate; new approaches must be and are being considered. Some problem areas and approaches are discussed. (Author)

AD-269 057 Div. 30, 15
(TISTP/MFA) OTS price $2.60

Cruft Lab., Harvard U., Cambridge, Mass.
ON COMPUTING MINIMA BY THE PENALTY FUNCTION APPROACH,
by Yu-Chi Ho. 10 Nov 61, 14p. incl. illus. 7 refs. (Technical rept. no. 347) (Contract Nonr-186616, NR-372-012)
Unclassified report

DESCRIPTORS: (*Calculus of variations, Digital computers, Programming, Data storage systems, Partial differential equations, Numerical analysis.)

AD-269 110 Div. 30, 19, 12
(TISTE/NTM) OTS price $8.60

Lockheed Electronics Co., Metuchen, N. J.
RESEARCH DIRECTED TOWARD DESIGN AND DEVELOPMENT OF EXPERIMENTAL DATA PROCESSING EQUIPMENT.
Interim scientific rept.
Nov 61, 88p. incl. illus. tables. (Contract AF 19(604)6104) (AFCRL-977)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Laboratories, Design, Reliability, Simulation, Applied psychology, Human engineering.) (Aerial reconnaissance, Air traffic control systems, Ground controlled interception systems, Command systems, Control systems, Guided missile research.)

Design, development and modifications are presented on the following: course generator unit, digital circuit analyzer, punched card data insertion, ancillary data storage and decoding, supplementary data console, drum storage unit installation and checkout, constant level recording amplifier, readout capabilities, X-H display techniques, radar site number intensification selection, raid size modification, scale factor conversion of velocity readouts, and electronic display of site location.

AD-269 135 Div. 30, 26
(TISTW/DLW) OTS price $1.60

Watertown Arsenal Labs., Mass.
DEVELOPMENT OF RADIOGRAPHIC TECHNIQUES FOR THE INSPECTION OF URANIUM TUBULAR SHAPES.
Report on Industrial Engineering Method Development,
by Satrak Der Boghosian and Ernest H. Rodgers.
Dec 61, 15p. incl. illus. 2 refs. (Technical rept. no. WAL TR 142.1/1)
(DA proj. 512-15-030)
Unclassified report

DESCRIPTORS: (*Uranium, Uranium alloys, Nondestructive testing, X-ray photography, *Radiography, *X-ray generators, Test equipment, Processing, Test methods, Quality control.)

Various radiographic techniques were investigated to determine optimum techniques, using suitable radiation sources, in examining uranium tubular shapes. One-mev resonance transformer and two-mev constant potential radiographic units can be employed to yield 2 T radiography of the uranium tubular shapes as well as other uranium configurations. The data generated should prove useful in preparing inspection requirements for end item specifications. (Author)

AD-269 206 Div. 30
(TISTA/VGW) OTS price $2.50

Laboratories for Applied Sciences, U. of Chicago, Ill.
THE ARC JET AS A MEANS OF PRODUCING FULL TEMPERATURE SIMULATION IN A HYPERSONIC WIND TUNNEL (APPLICATION OF A CROSSED FIELD ACCELERATOR).
Rept. for 1 Jan 59-1 Feb 60 on Experimental Simulation of Flight Mechanics,
by R. M. Krupa and P. J. Dickerman. Oct 61, 97p. incl. illus. tables (Rept. no. LAS-TR-162-25)
(Contract AF 33(616)6147, Proj. 1426)
(ASD TR 61-283) Unclassified report

DESCRIPTORS: *Hypersonic wind tunnels, Electric arcs, Plasma jets, Acceleration by Ion accelerators, Supersonic nozzles, Magnetohydrodynamics, Design, Mathematical analysis, Tables.) (*Hypersonic, Temperature, High temperature research, Simulation, Wind tunnels, Test facilities.)

The general concept of using crossed electrostatic and magnetic fields to accelerate the flow of an ionized plasma was investigated experimentally and theoretically. The experimental installation consists of the following units: an air-stabilized arc which serves as the plasma generator, an inlet viewing chamber for velocity measurements, the acceleration section, an outlet viewing chamber, the test section with quartz viewing window, and finally the vacuum system. The experimental effort consists in correlating the input and output accelerator velocity and Mach number with the applied electromagnetic fields, mass flow, and gross operating parameters of the installation. The theoretical results of the one-dimensional, steady, compressible flow treatment of the problem are presented. These results are summarized in the form of nondimensional charts which display the role of the relevant nondimensional groups that enter into the interaction. These charts readily establish the performance limits of such an accelerator. (Author)

AD-269 207 Div. 30
(TISTW/RD) OTS price $2.60

Army Rocket and Guided Missile Agency, Huntsville, Ala.
THE DESIGN AND CONSTRUCTION OF THE ARGMA, 8,000-kw PLASMA FACILITY.
Interim rept.,
by J. J. Ehrlich, J. F. Perkins and others.
25 Oct 61, 24p. incl. illus. tables, 5 refs.
(Rept. no. ARGMA TN 2H5N)
Unclassified report

DESCRIPTORS: (Design of *Test facilities for *High temperature research.) (Hypersonic wind tunnels for Production of Gas discharges.) (Simulation of Shock waves around Blunt bodies.) (Simulation of Atmosphere during Atmosphere entry of Re-entry vehicles.) (Vacuum systems, Design.) Plasma physics.

Complete design considerations for the ARGMA 8,000-kw plasma facility are reviewed. Both facility requirements and performance characteristics are discussed for typical minimum energy ICBM and IRBM reentry trajectories. Calculated stagnation conditions are shown to be in the realm of modern plasma arc technology. Capability of the installed electric generation system is shown to be adequate to meet requirements. (Author)

AD-269 210 Div. 30
(TISTE/CDM) OTS price $1.60

Weston Instruments Div., Daystrom, Inc., Newark, N. J.
PRODUCTION ENGINEERING MEASURE FOR RUGGEDIZED TAUT BAND SUSPENSION PANEL METERS PER SIGNAL CORPS TECHNICAL REQUIREMENTS SCS-43A.
Quarterly progress rept. no. 2, 1 July-30 Sep 61.
30 Sep 61, 12p. illus.
(Contract DA 36-039-sc-85952)
Unclassified report

DESCRIPTORS: (*Meters, Design, Production.) (*Springs, Shock, Vibration, Tests.)

Significant progress was made in obtaining the required performance for the 2-1/2 inch 100 degree instruments after subjection to vibration, tumbling and shock tests. The problem of ribbon breakage during tests was solved for ribbon sizes suitable for application in instruments having a full scale sensitivity of 20 microamperes. The electrical test results of the instruments emphatically demonstrate the superior performance of ruggedized taut band suspension meters over conventional ruggedized pivoted meters. The problem of ribbon breakage during the high shock tests was analyzed with an accelerometer-oscilloscope technique. A good measure of progress was attained in suspension ribbon fabrication. Quantities of the smallest size ribbon required for instruments on this contract were made. Engineering drawing for the 1 inch - 180 degrees and the 2-1/2 and 3-1/2 inch 250 degree meters were completed. The short taut band suspension ribbons permit the over-all dimensions to be physically interchangeable with conventional pivoted type meters. (Author)

AD-269 212 Div. 30, 8
(TISTP/WH) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
A COMPUTER-PROGRAMMED COMPONENT TOLERANCE ANALYSIS,
by Elbert L. Cox. 17 Nov 61, 19p. incl. illus. 1 ref. (Rept. no. TR-990)
Unclassified report

DESCRIPTORS: (*Reliability, *Digital computers, Programming, Electronic circuits.) (Semiconductors, Trigger circuits.)

A technique for testing the operability of a binary counter design is described. The six inequalities employed in this technique were derived. These inequalities, the operating equations, described necessary conditions for the transistors to be in the ON and OFF states and the necessary conditions for switching either transistor from the ON to the OFF state. The operating equations formed the basis for a computer program which was written in a manner such that the IBM 704 could predict the probability that a binary counter employing, first ±50-percent tolerances passive components and second, ±20 percent tolerance passive components would operate normally. The results indicate that ±50-percent tolerance components afford a probability of normal circuit operation equal to 0.919, compared with 1.0 probability for 20-percent tolerance components. (Author)

AD-269 214 Div. 30
(TISTE/CDM) OTS price $2.60

Systems Research Center, Case Inst. of Tech., Cleveland, Ohio.
ON THE COMPENSATION OF THE INFLUENCE OF DELAYS IN MULTIVARIABLE DISCRETE AUTOMATIC CONTROL SYSTEMS,
by Anatol Gosiewski. 1 Jan 62, 24p. incl. illus. 14 refs.
(Contracts Nonr-114109 and Nonr-114112)
Unclassified report

DESCRIPTORS: (*Control systems, Automatic, Time delay relays, *Linear systems, Theory, Mathematical analysis, Integral transforms.) (Data processing systems, Digital systems.)

A general method for the compensation of the influence of delays in multivariable linear discrete automatic control systems is presented. As a result of the synthesis based on the presented method, a compensated system is obtained. The resulting closed-loop dynamics of the compensated system is identical with the closed-loop dynamics of the system without delays, and only the behavior of the output signal of closed-loop compensated system is affected by the occurring delays. Certain properties of multivariable systems, which distinguish the problem from the analogous one in a single-variable case, are emphasized. Some advantages for the compensation of the influence of delays in discrete systems in comparison to the same in continuous systems are discussed. In the conclusion some prospects of the method and a possible direction of further investigation are given. (Author)

AD-269 248 Div. 30
(TISTP/WH) OTS price $8.10

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
ADEPT - AN AUTOMATIC DATA EXTRACTOR AND PLOTTING TABLE FOR HIGH SPEED REPETITIVE ANALOG COMPUTATION,
by Thomas P. Fitzgibbon. Mar 61, 89p. incl. illus. tables (Rept. no. R-297)
(Contract AF 04(647)303)
Unclassified report

DESCRIPTORS: (*Analog computers, Electronic circuits, *Data processing systems, Design, Operation.)

An instrument called ADEPT, an automatic data extractor and plotting table, is described. The ADEPT is designed to plot results from problems being solved on a high-speed repetitive analog computer. In one instance, automatically plotted results were obtained from the computer in seconds that hitherto required days. It has six automatic plotting modes that made it easy to obtain a wide variety of information from the computer solutions. The device operates by holding in storage the magnitude of a solution until it can be plotted. An incrementing coefficient plot, used as a problem parameter, is included in the ADEPT which allows computer solutions to be changed automatically. For each increment of this coefficient point, one point is plotted. (Author)

AD-269 249 Div. 30, 12
(TISTP/JW) OTS price $9.60

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
COMPENSATION OF A DIGITAL INTEGRATING ACCELEROMETER.
Master's thesis,
by Robert Hayum. June 59, 112p. incl. illus. tables, 12 refs. (Rept. no. T-209)
(Contract AF 04(647)303)
Unclassified report

DESCRIPTORS: (*Inertial guidance, Accelerometers, Digital systems, Feedback, Errors.) (Measurement, Velocity, *Digital computers.) (*Transducers, Torque.) Theses.

Compensation of a Digital Integrating Accelerometer, necessitated by the unusual moding behavior of a nonlinear sampled-data system, is presented. With the system compensated, highest frequency limit cycles are established and system errors are minimized. A new configuration is proposed using a conventional torque generator microsyn as both a torquing and sensing device. The microsyn is commanded by a flip-flop. This pulsed microsyn also presents a convenient and easy method for attaining the compensation. REAC simulation is used to demonstrate the effect of the compensation and to illustrate the systems' dynamic behavior. Cross-coupling error is investigated to determine if any appreciable error is introduced. A pure sampled-data approach is presented to show a new method of analysis. The nonlinear difference equation of the compensated system is derived. Acceleration commands are given to the system with and without compensation and the resultant error in the indicated velocity is plotted. (Author)

AD-269 316 Div. 30, 2
(TISTW/RD) OTS price $1.60

Control Equipment Corp., Needham Heights, Mass.
INSTRUMENTATION FOR USE IN THE STUDY OF EXTRA-TERRESTRIAL PARTICLES.
Final rept.,
by Harry E. Adams. Nov 61, 10p. 3 refs.
(Contract AF 19(604)7352, Proj. no. 7667)
(AFCRL-1079) Unclassified report

DESCRIPTORS: (*Meteorites, Particles, *Instrumentation, Measurement.) (Meteorites, Simulation of Detection.) (Calibration of Meteorites, Particles, Detectors.) (Vacuum systems for Acceleration of Particles.) (Hypervelocity guns for Acceleration of Particles.) (Instrumentation for Analysis of *Interstellar matter.)

Research was directed toward the determination of the properties of extra-terrestrial particles entering the earth's atmosphere. Instrumentation and techniques were developed with which to measure the influx rate, size, mass, and velocity of micrometeorites. Additional instrumentation was developed to study and calibrate micrometeorite detectors in the laboratory and to investigate new detection techniques. Instruments were installed in balloons, rockets, and other space vehicles and the data obtained from the flights of these vehicles was analyzed in the laboratory. (Author)

AD-269 371 Div. 30
(TISTE/CRJ) OTS price $1.60

Biotechnology Lab., U. of Calif., Los Angeles.
SYSTEM ANALYSIS TEST STANDS AND TRANSDUCERS,
by G. Paskusz and G. Gwynne. Sep 61, 14p. incl. illus. table (Rept. no. 61-57; Technical note no. 18)
Unclassified report

DESCRIPTORS: (*Transducers, Test equipment, *Test facilities, Solenoids, Pneumatic systems, Operation, Design.)

Two test stands were designed and built to aid in the evaluation of prosthetic systems and components. The first, a systems test stand, yields time data on AE prosthetic system performance. The second, a component test stand is specifically designed for the determination of actuator force-length relationships. The systems test stand consists of elbow, forearm, VO hook, and dual cable control, and is powered by 2 BPA's, connected in tandem. The test specimen is operated from the control chassis, while performance data are obtained from special transducers in the system and from electrical connections in the control circuit. The component test stand incorporates a force transducer, a velocity transducer, a loading platform, and a variable damper. Weight loading of the test actuator can be replaced by constant force spring loading where inertia effects are not desired. This test stand will make possible the comparative evaluation of prosthesis actuators under widely variable conditions of loading and damping. (Author)

AD-269 378 Div. 30, 15
(TISTP/WH) OTS price $1.60

Institute of Mathematical Sciences, New York U., N. Y.
A MACHINE PROGRAM FOR THEOREM-PROVING,
by Martin Davis, George Logemann, and Donald Loveland. 8 June 61, 13p. 3 refs. (Rept. no. IMM-NYU-288)
(Contract AF 49(638)777)
(AFOSR-819) Unclassified report

DESCRIPTORS: (*Programming, Digital computers, Mathematical logic, *Calculus of variations, Combinatorial analysis.)

The programming of a proof procedure is discussed in connection with trial runs and possible improvements. (Author)

AD-269 418 Div. 30, 8
(TISTE/CDM) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
ASYNCHRONOUS DIGITAL LOGIC CIRCUITS USING NEURISTORS.
Master's thesis,
by Andreus August Piske, Jr. Aug 61, 68p. incl. illus. tables, 2 refs. (Rept. no. GA/EE/61-3)
Unclassified report

DESCRIPTORS: (Theses, *Computer logic, *Digital computers, *Electronic circuits, Combinatorial analysis, Sequential analysis, Delay circuits.)

A study was made of the use of neuristors in the construction of asynchronous digital logic circuits. Specifically, the primary objective was the development of a formalized method for the design and the construction of asynchronous sequential circuits. The neuristor is an active device which acts as a one-dimensional channel along which a pulse may propagate at a constant velocity. Neuristors can be joined in 2 basic junction types: T and S junctions. A T-S junction is a combination of the 2 basic junction types. Using these 3 junction types, and, or and not circuits can be constructed. These basic circuits can be combined with a variable tree to construct any arbitrary combinational circuit. The neuristor has built-in delay. Sequential circuits can be analysed as delay devices and reduced to combinational circuits, which can be constructed using neuristors. (Author)

AD-269 421 Div. 30, 15
(TISTP/MFA) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
A RELAY COMPUTER USING THE PRINCIPLES OF MODULAR ARITHMETIC.
Master's thesis,
by Gerald Forrest Mackey. Aug 61, 52p. incl. illus. tables, 7 refs. (Rept. no. GE/EE/61-13)
Unclassified report

DESCRIPTORS: (*Digital computers, *Computer logic, Coding, Number theory, Polynomials.) (Instrumentation, Wiring diagrams, Circuits.) Theses.

A description of the application of the theory of modular arithmetic to the problems of addition and multiplication in a relay computer is given. Modular arithmetic is explained. Emphasis is given to the advantage of modular arithmetic, its absence of carry, and its disadvantages, division, fractions, and sign determination. The description of a multiplier-adder using decimal input modular output and a plan for a modular-to-mixed radix converter are given. A device for the evaluation of P(X) of a polynomial is proposed. The idea of a residue set as a vector is the basis for the proof of the Chinese Remainder Theorem which is given. (Author)

AD-269 423 Div. 30, 25
(TISTE/CDM) OTS price $5.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
A FEASIBILITY STUDY OF A MAGNETO-HYDRODYNAMIC CENTRIFUGE.
Master's thesis,
by Luin Blunt Ricks. Aug 61, 59p. incl. illus. tables, 10 refs. (Rept. no. GE/EE/61-15)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, *Centrifuges, Theory, Design, Mathematical analysis, Tests.) (Direct current, Electric motors, Mercury, Armatures, Liquid metals, Vortices.) Theses.

A study was made of the magneto-hydrodynamic centrifuge, a direct-current motor with a mercury armature. Centrifuging action is derived from the rotating mercury which, at sufficient speeds, assumes the shape of a hollow ring. A development prototype is designed and tested to determine the feasibility of such a centrifuge. Results were promising and indicated that the basic operational principle is sound and feasible. A paddle wheel was rotated at 2000 rpm by a rotating ring of mercury at an estimated mercury input power of 5 watts. (Author)

AD-269 426 Div. 30, 15
(TISTP/MFA) OTS price $8.10

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
AUTOMATIC COMPUTATION OF ROOT LOCUS USING DIGITAL COMPUTER.
Master's thesis,
by Stuart Brown Herndon. Aug 61, 88p. incl. illus. tables, 4 refs. (Rept. no. GE/EE/61-7)
Unclassified report

DESCRIPTORS: (*Digital computers, Automation, *Programming, Polynomials, Partial differential equations.) (Data, Tables.) (Feedback, Servo systems.) Theses.

The problem of computing the root locus is transformed into the format of repeated solutions of the characteristic equation expressed as a polynomial equation of degree N. To resolve the problem of convergence, a simultaneous Newton-Raphson and Bairstow iteration, with substitution of variables when required, is employed to solve the polynomial equation. By means of a systematized iterative process, a program is developed in FORTRAN language for the IBM 1620 which computes the root locus automatically. Several root loci formed by plotting the roots evaluated by the computer, which are accurate to at least four figures, are provided in the Appendices. (Author)

AD-269 530 Div. 30
(TISTB/CCH) OTS price $2.60

Biological Labs., Frederick, Md.
LABORATORY DESIGN FOR STUDY OF INFECTIOUS DISEASE,
by Everett Hanel, Jr., G. Briggs Phillips, and Gardner G. Gremillion. Jan 62, 29p. 36 refs.
(Technical Manuscript no. 1)
(BWL Proj. no. 4B11-05-015)
Unclassified report

DESCRIPTORS: (*Biological laboratories, *Test facilities, *Safety, Safety devices, Countermeasures, Infections, Diseases, Fungi, Bacteria, Viruses.)

Some fundamental criteria and typical layout sketches are presented to assist those interested in designing new infectious-disease laboratories or in the conversion of existing facilities. Typical safety equipment desirable in these laboratories is described. The basic concepts presented, and the equipment recommended, have been proved in actual practice and found to be of value in preventing laboratory infections. (Author)

AD-269 542 Div. 30, 8
(TISTP/TL) OTS price $3.60

Catholic U. of merica, Washington, D. C.
FERRIELECTRICS AS A POSSIBLE COMPUTER ELEMENT,
by Charles F. lvari. Oct 61, 34p. incl. illus. tables, 8 refs.
(Contract AF 33(616)7423, Proj. 7062)
(ASD TR 61-331) Unclassified report

DESCRIPTORS: (*Ferroelectric materials, Electrical properties, High temperature research, Switching circuits.) (Computer logic, Tests, Non-destructive testing, Polarization, *Digital computers, *Memory devices.)

Research on high temperature ferroelectric storage media led to the discovery of a class of ferroelectric materials which require a minimum threshold field for switching. This property was heretofore not observed in ordinary ferroelectrics and compares with similar properties found in ferrite cores. Work was conducted essentially to exploit the phenomenon of ferrielectricity for application in computer logical devices. The feasibility of preparing capacitors having a ferrielectric as a dielectric was investigated. Limiting electrical parameters of the device were determined. Finally, a novel non-destructive readout method was investigated using electromagnetic interferometer techniques. With the experimental device constructed, the best signal-to-noise ratio obtained was 6:1. It is possible to obtain millions of readouts from a ferroelectric capacitor without destroying the state of polarization of the ferroelectric capacitor. (Author)

AD-269 547 Div. 30, 15
(TISTP/TL) OTS price $6.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
KINEMATIC AND TESSELLATION MODELS OF SELF-REPAIR,
by Lars Lofgren. 1 Dec 61, 61p. incl. illus. 17 refs. (Technical rept. no. 8)
(Contract Nonr-183421, Proj. NR 49-123)
Unclassified report

DESCRIPTORS: (*Automation, Theory, *Metamathematics.) (Electrical networks, *Cybernetics, Errors, Life expectancy, Reliability.) (Combinatorial analysis, Sampling, Probability, Statistical processes, Taylor's series, Matrix algebra, Integral equations.) Probability, Quantum mechanics.

The concept of self-repair is studied in terms of automata theory. Different classes of automata (systems), like well-localized and non-well-localized automata, are considered. The parts (components) of the automata are uniformly exposed to errors. It is shown that if an automaton of a certain class has a life-span, not exceeded by any other automaton of the class, then it must contain a repairing mechanism. Such automata can be said to be self-repairing with respect to the class. A definition of self-repair is suggested. It is found that a self-repairing system, which is well-localized with respect to its inputs and outputs, has a finite life-span. This corresponds to the finite life-span we observe in nature for any animal or for any well-localized machine. On the other hand, if we relax the condition that the automaton be well-localized, then infinite life-spans can be obtained. Such automata have also self-reproducing properties and we obtain here a connection between the concepts of self-repair and self-reproduction. These self-repairing automata are in a way similar to growing biological societies with loosely specified internal structures. (Author)

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-269 563 Div. 30, 15
(TISTP/MFA) OTS price $1.60

New York U. Coll. of Engineering, N. .
COMPUTER OPTIMIZATION OF NONLINEAR C TROL SYSTEMS BY MEANS OF DIGITIZED MAXIMU PRINCIPLE,
by S. S. L. Chang. Mar 61, 9p. incl. illus. 7 refs. (Technical rept. no. 400-26)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-513) Unclassified report

DESCRIPTORS: (*Digital computers, Data processing systems, *Linear programming, Nonlinear systems, Calculus of variations, Difference equations.) (Memory devices, Differential equations, Complex variables, (*Mathematical analysis, Perturbation theory, Time, Costs, Guided missile trajectories.)

A digitized version of the maximum principle is derived by a simple and elementary method. In the limit of the discrete time interval approaching zero, the digitized maximum principle is reduced to Pontryagin's maximum principle. The digitized version can be readily programmed on a computer, and all four types of optimization problems: (1) minimum time, (2) maximum range, (3) minimum cost between terminal points, and (4) maximum gain (or minimum cost) in a given interval, are solvable by this method. The computation of the optimum process requires relatively little computer memory, and is exact for systems describable by a set of difference equations. The use of a computer to implement the computed optimum process in various ways is discussed. A more general condition for bang-bang control is also derived. (Author)

AD-269 565 Div. 30, 15
(TISTP/MFA) OTS price $1.60

New York U. Coll. of Engineering, N. Y.
DYNAMIC PROGRAMMING AND PONTRYAGIN'S MAXIMUM PRINCIPLE,
by S. S. L. Chang. June 61, 15p. illus. 3 refs.
(Technical rept. no. 400-32)
(Contract AF 49(638)586, Proj. 9768)
(AFOSR-865) Unclassified report

DESCRIPTORS: (*Algebraic topology, Functional analysis.) (*Programming, Digital computers, Memory devices, Errors.) (Nonlinear systems, Control systems, *Guided missile trajectories.) (Perturbation theory, Partial differential equations.)

Bellman's dynamic programming and Pontryagin's maximum principle are generally regarded as two alternative ways of solving the problem of optimum control of a nonlinear system. A multistage decision process is described and applied to an optimal trajectory. The maximum principle is derived when one tries to overcome certain practical difficulties in dynamic programming. (Author)

AD-269 573 Div. 30, 26
(TISTP/MFA) OTS price $8.10

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATIONS IN COMPUTER-AIDED DESIGN.
Interim engineering rept. no. 2, 1 June 60-28 Feb 61,
by Douglas T. Ross and Steven A. Coons. Nov 61, 81p. incl. illus. (Rept. no. 8436-IR-2)
(Contract AF 33(600)40604)
Unclassified report

DESCRIPTORS: (*Digital computers, *Programming, Mathematical logic, Mechanical engineering, Machine tools.) (Memory devices, Design, *Data processing systems, Data storage systems.) (Statistical analysis, Reliability, Topology.) (Mathematical analysis, Stresses, Quality control.)

The application of the concepts and techniques of modern data processing to the design of mechanical parts, and the further development of automatic programming systems for numerically controlled machine tools are studied. Topics covered include (1) a description of initial work on a bootstrap compiler for programming with ''plex'' structures, including the handling of free storage and symbol tables; (2) modifications to the new calculating program (ARELEM) for the APT System; (3) initial experiments with graphical languages; (4) some proposals for improved computer design for manipulating plex structures; (5) summaries of theses on graphical languages, stress analysis and selection of standard parts; and (6) mathematical techniques useful in design. (Author)

AD-269 588 Div. 30, 5
(TISTW/DLW) OTS price $1.60

Motorola, Inc., Scottsdale, Ariz.
EXTENSION OF ELECTRONIC EQUIPMENT LIFE PREDICTION STUDY.
Quarterly progress rept. no. 1, 15 July-15 Oct 61,
by A. T. Kneale and M. Esher. 15 Oct 61, 17p. incl. illus. (Rept. no. WP-2643-1)
(Contract DA 36-039-sc-87235)
Unclassified report

DESCRIPTORS: (*Test sets, Test equipment, Maintenance equipment, Instrumentation, *Radio equipment, Electronic equipment Failure (Mechanics), Life expectancy, Mathematical prediction, Design, Feasibility studies.)

An investigation is being made to prove the feasibility of providing field instrumentation capable of measuring the rate of degradation of performance of individual pieces of electronic equipment. The rate of degradation shall be measured directly on an individual electronic equipment and expressed in terms of operating time remaining until failure occurs. (Author)

AD-269 629 Div. 30, 26
(TISTM/EJH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ELECTRON-BEAM GUNS FOR WELDING OF METALS IN VACUUM,
by Yu. M. Kozlov. 8 Aug 61, 14p. (Trans. no. MCL-1172/1 of Svarochnoye Proizvodstov 1:38-40, 1961)
Unclassified report

DESCRIPTORS: (Metals, Vacuum apparatus, *Welding, *Electron guns, Electron beams, Focusing, Control, Operation, Electrons, Density, Power supplies.) (Processing, *Manufacturing methods.) USSR.

Two types of industrial two-stage guns were developed which provide electron beams with diameter of 0.8-1.5 mm at gun power of up to 1.5 kw

and accelerating voltage of 22-25 kv. Methods were developed for determining the principal characteristics of electron guns (conductance of system, focal length, beam diameter). High-voltage power supplies with output of 3-5 kw were developed for the electron guns. Electron beam pressure at the melting puddle pool was calculated. (Author)

AD-269 642 Div. 30
(TISTB/MS) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
NATURE (SELECTED ARTICLES).
17 Aug 61, 5p. incl. illus. (Trans. no. MCL-1255/1 of Priroda 9; pp. 3, 5, 1960)
Unclassified report

DESCRIPTORS: (*USSR, *Scientific research, *Space probes, *Space flight.)

AD-269 685 Div. 30, 9, 12
(TISTA/VGW) OTS price $3.60

Naval Ordnance Lab., White Oak, Md.
THE MEASUREMENT OF AERODYNAMIC FORCES AND MOMENTS IN THE NOL 4-IN. HYPERSONIC SHOCK TUNNEL NO. 3,
by D. F. Gates and D. N. Bixler. Nov 61, 29p. incl. illus. table, 13 refs. (NOLTR 61-100; Ballistics research rept. no. 51)
Unclassified report

DESCRIPTORS: (*Shock tubes, *Hypersonic wind tunnels, Test facilities, High speed photography, Test methods, Operation, Design.) (Wind tunnel models, Spheres, Re-entry vehicles, Aerodynamics, Re-entry aerodynamics, Guided missiles, Lift, Drag, Moments, Stability, Measurement, Model tests.) (Shock tubes, Experimental data, Mathematical analysis.)

Two light-weight models of missiles are suspended by fine threads. Alongside, a light-weight sphere is suspended. A high-speed camera is focused on the models through a window and illumination is by a short-duration, high-intensity light source. When the shock tunnel is fired, the light source is actuated, the fine threads are snapped, and the models are photographed for 2-1/4 milliseconds as they move freely in the shock tunnel flow. From high-speed film, data of the horizontal, vertical, and angular motions of the models and the sphere as functions of time are obtained. (Author)

AD-269 696 Div. 30, 8
(TISTP/FR) OTS price $12.00

RCA Industrial Electronic Products, Camden, N. J.
PROJECT LIGHTNING.
Interim research rept. no. 10A, 1 Mar-30 May 61 on High-Speed Data Processor System Research.
30 May 61, 164p. incl. illus. tables.
(Contract NObsr-77523)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Computers.) (*Electronic circuits, Computer logic, Memory devices, Diodes.) Research program administration.

Work was directed toward setting the stage for the construction of a subsystem which will demonstrate the feasibility of the techniques developed during the previous periods. It was decided that the best choice for logic circuitry lay in the d-c drivenclassification. The broad groundwork for all construction decisions was made and many detailed ones have been firmed up. Individual monostable amplifiers of the type considered to be the backbone of the d-c approach have been operated at repetition rates as high as 940 mc. All the circuit types to be used in the memory work have been operated individually and many have been proved by use in the nine-word test memory. (Author)

AD-269 697 Div. 30, 8
(TISTP/FR) OTS price $2.60

RCA Industrial Electronic Products, Camden, N. J.
PROJECT LIGHTNING.
System study rept. no. 6, Appendix 1, 1 Mar-30 May 61 on High-Speed Data Processor System Research,
by Peter Warburton. 30 May 61, 23p. incl. illus.
(Appendix 1 to Interim research rept. no. 10A, AD-269 696)
(Contract NObsr-77523)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Computers.) (Electronic circuits, Computer logic, Memory devices, Diodes.) Research program administration.

Application of the processor system has been modified somewhat in that the kilomegacycle computer is to be considered part of a larger data-processing system and is not intended primarily for arithmetic problems. The question of conventional versus unconventional design is discussed. Another boundary, that of the effect of tunnel-diode components, has been modified in that the low fan power of tunnel diode circuits conflicts with the desire for complex and sophisticated logic. Various aspects of input-output are also discussed, and the control scheme is presented. Finally, the characteristics of three proposed computers (from large to small) are set forth as a Family of Designs. (Author)

AD-269 698 Div. 30, 8
(TISTP/FR) OTS price $10.10

RCA Industrial Electronic Products, Camden, N. J.
PROJECT LIGHTNING.
Interim research rept. no. 10A on High-Speed Data Processor System Research.
1 June 61, 123p. incl. illus. tables (Suppl. to Interim research rept. no. 10A, AD-269 696)
(Contract NObsr-77523)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Computers.) (*Electronic circuits, Computer logic, Memory devices.) (Transistors, Triodes, Cadmium compounds, Sulfides, Thin films, Semiconductor films, Crystals.) (Diodes, Germanium, Gallium compounds, Arsenides.) (Transmission lines, Electrical connectors.) Oscilloscopes.

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-269 807 Div. 30, 22
(TISTW/RD) OTS price $21.00

Army Research Office, Durham, N. C.
PROCEEDINGS OF THE SIXTH CONFERENCE ON THE DESIGN OF EXPERIMENTS IN ARMY RESEARCH DEVELOPMENT AND TESTING SPONSORED BY THE ARMY MATHEMATICS STEERING COMMITTEE CONDUCTED AT THE BALLISTIC RESEARCH LABORATORIES, ABERDEEN PROVING GROUND, MARYLAND, 19-21 OCTOBER 1960.
Dec 61, 345p. incl. illus. tables, 40 refs.
(Rept. no. ARODR-61-2)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (Tests with Least squares method.) (Instrumentation for Measurement of *Guided missile trajectories.) (Test equipment for Model tests of Bacterial aerosols.) (Calibration of Detectors of Particles in *Aerosols.) (*Area bombing, Effectiveness.) (Safety of Armies from Guided missiles.) (Data processing systems, Analysis.) (Tests, *Rockets, *Spin stabilize ammunition.) (Land mines, Detection.) Army, *Scientific research, Ballistics, *Symposia.

AD-269 834 Div. 30
(TISTB/MS) OTS price $2.60

Bureau of Supplies and Accounts, Navy Dept., Washington, D. C.
TOTAL SYSTEM CONCEPT FOR A NAVY STOCK POINT, by Bernard Radack. Dec 60, 26p. incl. illus.
(Systems Research rept. no. 10)
(Proj. no. NTF 015-01-025)
Unclassified report

DESCRIPTORS: (*Data processing systems, *Naval logistics, Records, Naval supplies.) Management engineering.

This report presents a new data-processing concept for Navy Stock Points. The report is based on the following precepts: (1) The objective of the total system is rapid, predictable issues to customers, with the latter of predominant importance since predictable lead time will enable customers to adjust their operations to supply capabilities in an optimum manner. (2) The achievement of the total systems objective require that the entire issue processing cycle at a stock point; i.e., the total system be considered as a unit. The data-processing requirements of all of the functional areas must be considered, and these requirements must be definitively aligned with and expedite the material-processing system and shipping requirements. (3) The new concept applies to all major stock points, regardless of type or mission: (Author)

AD-269 867 Div. 30, 20
(TISTW/RD) OTS price $4.60

Aerospace Corp., El Segundo, Calif.
RESEARCH AND DEVELOPMENT OF A PROTON SPECTROMETER.
Semiannual technical rept., 1 Jan-30 June 61, by F. S. Mozer, D. D. Elliott, and A. F. Lawrence. 30 June 61, 42p. incl. illus.
(Rept. no. TDR-594(1245-02)TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (Design of *Spectrophotometers for Spectrographic analysis of Energy, *Protons, Van Allen radiation belt.) (Satellite vehicles, Instrumentation.) (*Scintillation counters, Crystals, Photomultipliers.) (Cesium compounds, Iodides, Pulse height analyzers.)

A proton spectrometer system has been developed to measure the flux and energy spectrum of protons above 1 Mev in the Van Allen radiation belts and interplanetary space. The instrument will be flown on the Advent satellite and other Air Force vehicles to obtain information pertinent to reliability of satellite components in the space environment. (Author)

AD-269 899 Div. 30
(TISTW/RD) OTS price $1.10

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
EVALUATION OF EMPIRE DEVICES NF-105 NOISE AND FIELD INTENSITY METER.
Phase rept., by W. Stinger. 18 Dec 61, 4p. incl. table.
(Rept. no. NADC-EL-61113)
Unclassified report

DESCRIPTORS: (Tests of Radio fields, Intensity, *Meters for Measurement of *Radio interference.)

A noise and field intensity meter was evaluated to determine its suitability for making radio interference measurements in accordance with military requirements. The results indicated that the meter is acceptable for measuring the parameters of interference signals required by the specifications at frequencies between 0.15 and 1000 mc. The performance of the meter compares favorably with the performance of the AN/PRM-1, TS-587/U, and AN/URM-17 interference measurement devices. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-269 129 Div. 31
(TISTE/CDM) OTS price $4.60

David Taylor Model Basin, Washington, D. C.
PERFORMANCE OF VERTICAL AXIS (CYCLOIDAL) PROPELLERS CALCULATED BY TANIGUCHI'S METHOD,
by W. L. Haberman and E. E. Harley. Nov 61, 39p. incl. illus. tables, 5 refs. (Rept. no. 1564)
(Proj. SR 009-01-01)
Unclassified report

DESCRIPTORS: (*Marine propellers, Rotation, Tests, Mathematical analysis.) (*Propeller blades, *Cycloidal propellers, Theory.)

A method proposed by Taniguchi was used to compute the performance characteristics of vertical axis propellers having cycloidal blade motion and semi-elliptic blades. Numerical results of thrust and torque coefficient and efficiency are presented for a wide range of advance coefficients, maximum blade angle, and blade solidity. Good agreement between the experimental performance and the computed results is obtained for 2, 3, and 6-bladed cycloidal propellers. (Author)

AD-269 269 Div. 31, 20
(TISTW/DLW) OTS price $7.60

Naval Radiological Defense Lab., San Francisco, Calif.
GAMMA-RAY PENETRATION EXPERIMENTS FOR A LIGHT AIRCRAFT CARRIER USING DISTANT SOURCES AND SOURCES SIMULATING CONTAMINATION OF THE HULL,
by S. Tomoeda, M. B. Hastings, and W. G. Miller. 19 Oct 61, 83p. incl. illus. tables, 4 refs. (Rept. no. NRDL-TR-533)
Unclassified report

DESCRIPTORS: (*Aircraft carriers, Naval vessels, Ship hulls, Ship plates, Flight decks, *Shielding, Gamma rays, Radioactivity, *Radiological contamination, Contamination, Radiation effects, Measurement, Tests, Effectiveness.) (Radioactive isotopes, Test equipment, Test methods.)

The penetration of gamma rays into compartments of an aircraft carrier from two different radioisotopes was measured in 2 experiments. In 1 experiment, cobalt-60 and cesium-137 point isotropic sources were exposed near the hull of the ship to simulate hull contamination. Measurements of dose were made in the forward part of the ship at 4 different deck levels. Dose distribtuion data are presented for the 2 sources used and for the different source points considered. In the 2nd experiment, a nominal 500-curie collimated cobalt-60 source was exposed at a distance of roughly 100 feet from designated points to irradiate 2 general regions of the ship. Dose distributions are presented for each of 18 source positions used. Five decks were instrumented in each of the 2 general regions considered. Diagrams indicating source positions, detector positions, and hull-plating thicknesses are presented. (Author)

AD-269 312 Div. 31, 25
(TIPSP/WH) OTS price $18.50

David Taylor Model Basin, Washington, D. C.
THEORY OF FREELY VIBRATING NONUNIFORM BEAMS, INCLUDING METHODS OF SOLUTION AND APPLICATION TO SHIPS,
by Ralph C. Leibowitz and E. H. Kennard. May 61, 281p. incl. illus. tables, 83 refs.
Unclassified report

DESCRIPTORS: (*Beams, Elasticity, Vibration, Mathematical analysis, *Ship hulls, Marine engineering.) (*Ship hulls, *Vibration, Mathematical analysis, Difference equations, *Analog computers, Digital computers.) (Physical properties, Deformation, Shear stresses, Torque, Elasticity, Structures.)

A comprehensive study was made of the derivation of equations for digital and electrical-analog solution of the natural frequencies and mode shapes of a ship's hull idealized as an elastic beam. Effects of bending, shear, rotary inertia, coupled torsion and bending, initial curvature of the elastic axis, applied forces and torques, sprung masses, and other inertias are included. The calculation of the physical parameters from ship plans is described, and the accuracy of the results obtained by digital and analog solution is discussed. (Author)

AD-269 317 Div. 31, 9
(TISTP/TL) OTS price $3.60

Institute of Engineering Research, U. of Calif.
ON THE UNSTABLE ROLLING MOTIONS OF SHIPS RESULTING FROM NONLINEAR COUPLING WITH PITCH INCLUDING THE EFFECT OF DAMPING IN ROLL,
by W. D. Kinney. Oct 61, 31p. incl. illus. 4 refs. (Series no. 173, Issue no. 3)
(Contract Nonr-22275, Proj. S-R009-01-01)
Unclassified report

DESCRIPTORS: (*Ships, Motion, Pitch, Damping, *Hydrodynamics, Stability, Sea water, Roll.) (*Ship models, Analog computers, Analysis, Theory, Frequency, Moments, Tests, Test equipment.) (Harmonic analysis, Differential equations, Least squares method, Vector analysis.)

The equations of motion for a ship pitching and rolling in a calm sea were found to be coupled by means of a second order term in the rolling equation of motion. When the pitching motion is simple harmonic the equation of motion in roll is of the Mathieu type, the two independent parameters being pitching amplitude and frequency. The stability diagram of the Mathieu equation including the effect of linear damping is determined theoretically and verified by solving the Mathieu equation on an analogue computer. In experiments with one ship model form, it was found that the transition from stable to unstable motion occurred for the value of the parameters predicted by the theory, and that the rolling motions obtained experimentally closely resembled the computer solutions. It was concluded that (1) unstable rolling motions are possible for very small pitching amplitudes, (2) when the natural frequency of pitch is twice that of roll the amplitude required to produce unstable motion is a minimum, and (3) for any pitching frequency, the greater the amount of damping, the greater the amplitude of pitching must become to produce unstable rolling motions. (Author)

AD-269 762 Div. 31, 9
(TISTP/MFA) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
GRAPHS FOR PREDICTING THE IDEAL HIGH-SPEED RESISTANCE OF PLANING CATAMARANS,
by Eugene P. Clement. Nov 61, 36p. incl. illus. tables, 4 refs. (Rept. no. 1573)
Unclassified report

DESCRIPTORS: (*Catamarans, *Tests, Design, Hydrodynamics, Boundary layer, Turbulence, *Resistance, Physical properties.) (*Mathematical prediction, Probability, Sampling.)

Graphs are presented by means of which the high-speed resistance and trim of catamaran planing hulls of a wide range of sizes and proportions can be determined. Graphs which give guidance in selecting parameters which will result in optimum planing performance are also presented. Values for the graphs were obtained from equations for the lift, center of pressure, and resistance of prismatic planing bottoms which were previously developed by the National Aeronautics and Space Administration and the David Taylor Model Basin. (Author)

AD-269 765 Div. 31, 25, 9
(TISTP/MFA) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
EXPERIMENTS ON ROTATIONAL IMPACT,
by Margaret D. Bledsoe and Frank M. Schwartz.
Oct 61, 17p. incl. illus. table, 2 refs. (Rept. no. 1145)

Unclassified report

DESCRIPTORS: (*Model tests, Impact shock, Pressure, Ships, *Ship hulls, Water, Surface properties, Rotation, Stability (Longitudinal).) (Test equipment, Experimental data, Tables, Photographic analysis.)

The results of an experimental investigation to determine the pressures produced on the bottom of a slamming ship when impact with the smooth water surface results from simple rotation in the plane of symmetry are presented. The effect of forward speed of advance is not included. Graphs are included which show pressure dependence on time and on shape for a particular transverse section. A comparison of experimental and theoretical average pressures for this station shows good agreement in magnitudes for the theoretical computations available. It is necessary to consider only those pressures which occur a short time after the keel contacts the water surface. Thus the proper application of the theory requires that the immersion be small, but greater than zero. With this restriction an examination of maximum pressures over the forward 22.5 percent of the ship's length shows that the region experiencing the highest pressures is located approximately at 9 percent of the ship's length aft of the forward perpendicular. (Author)

AD-269 775 Div. 31, 13
(TISTW/EET) OTS price $8.10

Westinghouse Electric Corp., Pittsburgh, Pa.
DESIGN OF MODEL OF A THERMOELECTRIC AIR CONDITIONING SYSTEM FOR SUBMARINES.
Final rept., 1 June 59-1 May 61,
by E. W. Frantti. 1 May 61, 75p. incl. illus. table (Rept. no. 9161-01208-208(1))
(Contract NObs-77095)

Unclassified report

DESCRIPTORS: (*Thermoelectricity, *Air conditioning equipment for *Submarines, Design, Theory.) (Refrigeration systems, Heat exchangers, Thermal insulation, Vibration, Shock, Tests.) (Heat transfer, Sea water, Water, Cooling.)

A thermoelectric heating and cooling module was constructed for installation in a water to water air conditioning system aboard a submarine. This module has a cooling rating of 2550 BTU/hr. at a coefficient of performance of 0.75 and an operating current of 35 amperes dc. This rating was based on a 85 F sink water temperature and a chill water temperature of 55 F. The unit was designed to withstand submergence pressures and the corrosive effect of sea water in all water passages. It occupies a volume 1 ft. by 1 ft. by 3 inches and was designed for ease in stacking into larger capacity units without additional space being required for coupling between units. It has a weight of 50 pounds. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-269 106 Div. 32
(TISTB/LH) OTS price $8.10

Rand Corp., Santa Monica, Calif.
THE SOVIET OIL OFFENSIVE AND INTER-BLOC ECONOMIC COMPETITION,
by Harold Lubell. Dec 61, 82p. incl. tables, refs. (Research memo. no. RM-2812-PR)
(Contract AF 49(638)700)

Unclassified report

DESCRIPTORS: (*USSR, *Economic conditions, *Mineral oils, Foreign policy.)

Data are presented on Soviet oil production and exports, and are related to the broader East-West economic struggle. The Soviet oil export drive illustrates three aspects of inter-bloc rivalry: competition in economic and technological achievement, competition for influence, and competition for markets. In each the Soviet oil offensive has achieved considerable success. The study assesses the effects of Soviet oil exports on the West as both consumer and producer of oil. As consumer, the West can gain from lower prices but runs the risk of a less reliable oil supply. Measures are discussed for reducing this risk by ensuring the availability of alternative supplies. (Author)

AD-269 538 Div. 32, 14
(TISTM/TCG) OTS price $1.50

Institute of Engineering Research, U. of Calif. Berkeley.
STRUCTURAL LAMINATES LITERATURE SURVEY.
Technical note, 1 Feb 60-31 Jan 61 on Mechanics of Flight,
by R. L. Taylor and K. S. Pister. Sep 61, 14p. 52 refs.
(Contract AF 33(616)6910, Proj. 7063)
(ARL-75)

Unclassified report

DESCRIPTORS: (*Laminates, *Structures, *Bibliography.) (Statics, Loading, Mechanical properties, Stresses, Equations, Structural shells, Elasticity, Differential equations, Failure (Mechanics).)

A survey of literature pertinent to analysis and behavior of structural laminates is presented.

The discussion is separated into four sections: (1) mechanical properties, (2) formulation of the governing equations, (3) solution techniques, and (4) failure criteria. In each section a short resume is given, in which the present state of knowledge is briefly summarized. References are given to abstracts which appear at the end of the report. (Author)

AD-269 714 Div. 32
(TISTB/MS) OTS price $2.60

Rand Corp., Santa Monica, Calif.
THE SUCCESSION PROBLEM AND THE TRANSITION TO COMMUNISM,
by Myron Rush. Aug 61, rev. Dec 61, 26p. refs.
(Rept. no. P-2386-1)
Unclassified report

DESCRIPTORS: (*USSR, *Communism, *Political science.)

AD-269 734 Div. 32
(TISTP/MFA) OTS price $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A TWO-SECTOR EXTENSION OF SWAN'S MODEL OF ECONOMIC GROWTH: THE CASE OF NO TECHNICAL CHANGE,
by Mordecai Kurz. 13 Dec 61, 26p. incl. illus.
(Technical rept. no. 103)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: (*Economics, *Economic conditions, Costs, Commerce, Money, Wages, Production.)

The purpose of the present analysis is to extend the Swan one-sector one-good model (The Economic Record, XXXII:334-361, 1956) into a two-sector two-good economy for the case of no technical change. In this case a simple diagrammatic representation of competitive growth is possible and the exposition is simple as well as indicative of the properties of two sector models. The composition of the capital stock and the labor is analyzed and the allocation of these factors between the two sectors is determined. Our two-sector model is the natural set-up for the analysis of the relative price of capital to consumer goods. (Author)

AD-269 735 Div. 32
(TISTP/MFA) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
PRODUCTION FUNCTIONS WITH CONSTANT ELASTICITIES OF SUBSTITUTION,
by Hirofumi Uzawa. 15 Dec 61, 17p. 8 refs.
(Technical rept. no. 104)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: (*Production, *Economics, *Factor analysis, Functions, Partial differential equations, Elasticity, Substitutes, Costs, Scheduling, Wages.)

The class of production functions for which elasticities of substitution are all constant regardless of factor prices is discussed. Let $f(x1,x2)$ be a production function where x1 and x2 respectively represent the amounts of factors 1 and 2 employed. Production is assumed to be subject to constant returns to scale and to diminishing marginal rates of substitution. (Author)

33. TRANSPORTATION

AD-269 375 Div. 33, 16, 28
(TISTB/LH) OTS price $3.60

California U., Los Angeles.
AN ENGINEERING ANALYSIS OF CARGO HANDLING. XII. PHYSIOLOGICAL MEASUREMENTS IN THE EVALUATION OF WORK METHOD CHANGES,
by Frank C. Hale. Nov 61, 25p. incl. illus. 16 refs. (Rept. no. 61-75)
(Contract Nonr-23307)
Unclassified report

DESCRIPTORS: *Cargo, *Handling, *Human engineering, Physiology, Effectiveness, Measurement, Personnel, Selection.

Efforts were directed toward the delineation and better understanding of some of the facets of the maritime cargo system. The prime tool in this effort has been the systems engineering approach, bringing together engineering analysis and design with communication theory, information theory, procedure analysis and other standard sampling and analytic tools. Physiological measurements were used to evaluate work method changes which may affect the individual worker. The physiological measures were the conventional oxygen consumption, or energy cost of the job, and the heart rate change, indicative of the strain or physiological cost of the job. The physical environmental measures included temperature, humidity and movement of the air. Measures were also taken of the contaminant level of the air within the hold due to the increased use of gasoline powered equipment. (Author)

33. TRANSPORTATION

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

* Descriptors marked with an asterisk are included in the subject index.

BIBLIOGRAPHY

OTS SB-476 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
CONTAINERS, PACKAGING, MATERIAL HANDLING, STORAGE. Nov 61, 27p. 490 refs. OTS Selective Bibliography SB-476.

DESCRIPTORS: *Containers, *Packaging, Materials, Handling, Storage, Cargo, *Bibliography

Lists 490 references (PB, AD, and AEC reports; translations; patents) on containers, packaging, materials handling, and storage. Includes reports pertinent to: packaging and containers for all types of materials and products; various materials used for packaging; cargo handling; transportability; safety; air and space flight requirements. (Author)

AGRICULTURE

UCLA-485 $2.60

California U., Los Angeles. School of Medicine.
PLANT UPTAKE OF RADIOISOTOPES FROM SOIL CONTAMINATED WITH MIXED FISSION PRODUCTS, by E. M. Romney, H. Nishita and others. Rept. on Contract AT(04-1)-GEN-12. Aug 61, 28p. 24 refs.

BEHAVIORAL SCIENCES

SCR-431 $1.60

Sandia Corp., Albuquerque, N. Mex.
POSITIONAL TOLERANCE TRAINING AIDS, by P. A. Nicovich and R. O. Dell. Aug 61, 12p.

Human Engineering

PB 158 648 $8.60

General Dynamics/Convair, San Diego, Calif.
STUDY OF THE HUMAN ELEMENT IN FUTURE ANTI-BALLISTIC MISSILE SYSTEMS, by Donald W. Conover. Final summary rept. pt. 1, on Contract Nonr-2953(00). 31 Dec 60, 98p. 17 refs. ZG-017; ARPA Order 5-58, Task 9; AD-250 503.

DESCRIPTORS: *Human engineering, Guided missile personnel, *Antiaircraft defense systems, Radar operators, *Guided missiles, Interception, Early warning radar, Control systems, Maintenance, Training, Management engineering, Data processing systems, Military operations.

Initial efforts were focused upon an analysis of the man-machine relationships in the Nike-Zeus system to develop a basis from which to extrapolate human factor considerations to systems of the future. A preliminary model of a hypothetical antiballistic missile (ABM) system is presented as a frame of reference. It is within this frame of reference that subsequent efforts will be undertaken in the development of system element requirements along behavioral dimensions common to both men and machines. Specific attention is focused upon the role of man in the command and control of ABM systems, the human function in system maintenance, and the human role in the management of system development programs. Broad outlines are suggested of a comprehensive design guide for the integration of man and machine in ABM system development, and a number of research problems are detailed relating to man-machine interactions. The solution of these problems is crucial to the effectiveness of future weapon system developments. (Author)

AD-266 320 repriced $2.00

Psychological Research Associates, Inc., Arlington, Va.
A DATA ORGANIZATION MODEL FOR THE PERSONNEL SUBSYSTEM, by Melvin R. Marks. Rept. July-Nov 60, on Technical Guides for Designers of Personnel Subsystem for New Weapon Systems, Contract AF 33(616)5738. Sep 61, 79p. 21 refs. ASD Technical rept. 61-447.

DESCRIPTORS: *Aviation personnel, *Data processing systems, Data storage systems, *Guided missile personnel, *Maintenance personnel, *Human engineering, *Guided missiles, Manned, *Satellite vehicles, Ground controlled interception systems, Aircraft defense systems, Weapons, Data, Processing, Coding, Military requirements, Handbooks, Personnel, Reports
The need for organizing Personnel-Equipment Data (PED) for any system is discussed; development considerations and constraints for such a model are described. It is concluded that a model which organizes all system basic data will serve for PED as well. A model is adopted which represents an analogue of the system itself, the model acting as an index or table of contents to the data. A hierarchical organization of system levels is defined and a locator-code symbol is devised to be the address and description of type for any particular datum. Examples are given of the application of the model to various types of systems. Problems in implementing the model in any system are discussed. Appendices representing categories applicable to the basic data of any system are presented. There is some discussion of possible mechanization of data storage and retrieval in connection with the use of the model. (Author)

PB 159 393 $8.10

Stanford Electronics Labs., Stanford U., Calif.
MACHINE LEARNING AND AUTOMATIC PATTERN RECOGNITION, by D. J. Braverman. Rept. on Contract Nonr-225(24). 17 Feb 61, 88p. 11 refs. Technical rept. no. 2003-1; AD-253 925.

DESCRIPTORS: *Learning, Mathematical analysis, Measurement, *Automation, Design, *Perception, Computers, Classification, Theory.

The machine recognition of the class of an object when objects in each class possess a common property which is unknown to the machine is discussed. The recognition is based upon the measurement of a set of characteristics of the object to be recognized and a collection of learning observations. Optimum, or Bayes, decision rules for recognition minimize the expectation of an arbitrary, preassigned function which measures the consequences of errors in recognition. Optimum decision rules are obtained as functions of the measurements of the characteristics of the object to be recognized and the learning observations with the aid of Statistical Decision Theory. The manner in which the learning observations must be used in optimum recognition systems, the inductive properties of optimum recognition systems, and the method of extraction of relevant information from the learning observations are also discussed. Examples of recognition systems for the minimization of the probability of incorrect recognition of one of a set of unknown, fixed signals in the presence of noise are presented to illustrate the theoretical development. The probability of incorrect recognition is obtained as a function of the number of learning observations, in order to evaluate the learning rate. (Author)

Psychology

PB 157 528 $3.60

American Inst. for Research, Santa Barbara, Calif. THE EFFECT OF RESPONSE MODE AND LEARNING MATERIAL DIFFICULTY ON AUTOMATED INSTRUCTION, by Robert A. Goldbeck. Technical rept. no. 1 on Contract Nonr-3077(00). Sep 60, 39p. 12 refs. AIR-328-60-IR-124; AD-246 222.

DESCRIPTORS: *Learning, *Reaction (Psychology), *Training, *Education, Programming, Test methods, Statistical analysis, Analysis of variance.

An experiment was conducted to determine the effects on learning of different response modes in combination with varied levels of learning response difficulty. The three response modes used were overt response (Subject (S) was required to construct a written response), covert response (S was permitted to think of a response), and implicit response (S read the response which was underlined). Three levels of difficulty were established by varying the amount of cues and prompts for the response word. The learning material was programmed as discrete discourse in which each frame was written to teach a single fact. The results cast doubt upon the assumption that the best learning is achieved by use of easy items and requiring written constructed responses. The results were discussed in terms of the conditions contributing to active responding and the importance of insuring correct responses during learning. (Author)

PB 158 637 $2.60

American Inst. for Research, Santa Barbara, Calif. FURTHER EXPERIMENTAL EVIDENCE ON RESPONSE MODES IN AUTOMATED INSTRUCTION, by Robert A. Goldbeck, Vincent N. Campbell, and Joan E. Llewellyn. Technical rept. no. 3 on Contract Nonr-3077(00). Dec 60, 27p. 9 refs. AIR-328-60-IR-132; AD-250 122.

DESCRIPTORS: *Learning, *Education, Programming, *Reading, *Training, *Reaction (Psychology), Test methods, Statistical analysis, Analysis of variance, Effectiveness.

An experiment was conducted to determine the effects of four response mode differences on auto-instructional learning, using a continuous discourse program of moderate difficulty. These modes were: (1) overt response (Subject (S) was required to construct a written response); (2) covert response (S was required to think of a response), (3) reading response (S read the response which was underlined); and (4) option response mode (S could either construct a written response or omit the response, depending on his confidence in being correct). Significant learning time differences were found among the four response mode conditions. The overt condition had the longest learning time, followed by the option mode, covert mode, and reading mode in that order. The results of this study using continuous discourse material are in general agreement with the findings from the previous study using independent-item frames, leading generally to the hypothesis that requiring written constructed responses to easy items is not an essential condition for effective learning. The results are discussed in terms of the conditions which contribute to active responding and efficient learning, with special emphasis on the reading mode of responding to programmed material. (Author)

PB 158 659 $8.10

American Inst. for Research [Pittsburgh, Pa.] INCREASING TEAM PROFICIENCY THROUGH TRAINING. I. PROGRAM OF RESEARCH, by David J. Klaus and Robert Glaser. Rept. on Contract Nonr-2551(00). Dec 60, 83p. 47 refs. AIR-264-60-TR-137; AD-252 866.

DESCRIPTORS: *Group dynamics, *Behavior, Effectiveness, *Learning, *Training, *Reaction (Psychology), Theory, *Leadership, Personnel, Test Methods, Laboratories.

The basic position of the program of research described is that the relationships which exist among the reinforcement parameters in the team training situation are fundamental variables in the attainment of team proficiency; and, that these relationships can be manipulated and measured in the laboratory. As a consequence the learning-theoretic approach being used represents a departure from most previous efforts to understand and improve the performance of working teams. The success or failure of this research program will be evidenced not only in how adequately it can describe team behavior, but in how well it can provide detailed recommendations as to methods for controlling team proficiency through training. The approach depends heavily upon four contributing factors: (1) the empirical, scientific knowledge of variables influencing learning by individuals; (2) the detailed analysis of previous work concerned with modifying group performance; (3) the experience gained from field studies of operational teams; and, (4) the preliminary investigations, pilot studies, and trial analyses carried out during the initial development of the Team Training Laboratory. (Author)

PB 159 263 $3.60

Florida U. [Gainesville].
INTERSENSORY DOMINANCE AND GENERALIZATION IN CONDITIONING, by H. D. Kimmel, Frances A. Hill, and R. L. Fowler. Technical rept. no. 2 on Transfer of Training Between Sensory Modes, Contract Nonr-580(09). Jan 61, 31p. 7 refs. AD-253 114.

DESCRIPTORS: *Conditioned reflex, Stimulation, Galvanic skin response, Tests, Reaction (Psychology).

The relationship between the order of conditioning of the separate elements of a compound conditioned stimulus and the magnitude of the conditioned galvanic skin response (GSR) produced by the compound stimulus was investigated. The stimulus elements were a 1,000 cps tone and a 1/4 inch square patch of white light. The stimuli were each 1.0 seconds in duration and the interstimulus interval during conditioning was 0.9 seconds, the last 0.1 seconds being shared by the tone or the light conditioned stimulus (CS) and an electric shock unconditioned stimulus (UCS). The results were interpreted as supporting the assumption that intersensory dominance in classical conditioning occurs and that intersensory transfer of conditioning may have also been an important factor. It was also considered possible that the unsystematic training order was in some way similar to partial reinforcement procedures, thus accounting for the lowered level of response during conditioning and the resistance to extinction shown by the Ss who had been trained in this way. (Author)

PB 158 029 $8.10

Human Factors Research, Inc., Los Angeles, Calif.
THE EFFECT OF IRRELEVANT ENVIRONMENTAL STIMULATION ON VIGILANCE PERFORMANCE, by James J. McGrath. Technical rept. 6 on Human Factor Problems in Anti-Submarine Warfare, Contract Nonr-2649(00). Nov 60, 88p. 33 refs. AD-252 151.

DESCRIPTORS: *Attention, Stimulation, Tests, Theory, *Reaction (Psychology), Psychology, Auditory signals, Antisubmarine warfare, Visual signals, Reaction time.

The results indicated that an increase in the variability of the environmental stimulation had a facilitating effect on detection performance. The experimental hypothesis was confirmed. These results were taken as counterevidence for a filter theory of vigilance and as support for an arousal theory of vigilance. (Author)

PB 159 297 $1.60

Iowa State U., Iowa City.
A FAILURE TO OBTAIN CONSISTENT UNCONDITIONED RESPONSES IN CLASSICAL FINGER WITHDRAWAL CONDITIONING, by Milton A. Trapold and Kenneth W. Spence. Technical rept. 6 on Studies of Influence of Motivation on Performance in Learning, Contract Nonr-1509(04). 5 Jan 61, 14p. 30 refs. AD-252 868.

DESCRIPTORS: *Conditioned reflex, Test methods, Motor reactions, *Reaction (Psychology), Stimulation

An experiment was conducted in which 18 subjects (Ss) were given 50 tone-shock conditioning trials in a typical finger withdrawal conditioning situation with the shock UCS as intense as S could stand it. Ss were allowed neither to escape nor avoid the shock UCS in any way. Primary interest was in checking a finding of exploratory research that with such a classical conditioning procedure stable and consistent unconditioned finger flexions were the exception rather than the rule over wide ranges of several shock parameters. Only three Ss gave a UCR on all 50 conditioning trials while 7 gave no UCRs at all. The remaining eight Ss ranged unsystematically between these two limits. Additional trials with more intense shock for those Ss not giving any UCRs ruled out the possibility that this failure was due to the shock being initially too weak. The results that the failure to get consistent UCRs makes the finger withdrawal conditioning situation unsuited for systematic research on the laws of classical aversive conditioning. (Author)

PB 159 270 $8.10

Louisiana State U. [Baton Rouge].
COMPARISONS OF THE BEHAVIOR IN GROUPS OF SELF-ORIENTED, INTERACTION-ORIENTED AND TASK-ORIENTED MEMBERS, by Bernard M. Bass. Technical rept. 25 on Behavior in Groups, Contract N7onr-35609. Jan 61, 88p. 23 refs. AD-254 432.

DESCRIPTORS: *Group dynamics, *Behavior, Adjustment (Psychology), Leadership, *Psychometrics, *Personality, *Personality tests, Needs, Reliability.

In Leadership, Psychology and Organizational Behavior (Bass, 1960a), we conceived of three types of group members, self, interaction and task-oriented. It was argued that attempts to lead under specified circumstances would be different among these three types of individuals. The SIT Inventory, consisting of forced choice questions about personal preferences, values and projections, was constructed as a device for screening populations for samples of these idealized types. This report dealt with the construction of the SIT, its reliability, norms and validity. Also included are results of four pilot projects representing applications of the SIT to testing specific hypotheses about the behavior of these idealized types in groups. (Author)

PB 157 491 $1.10

Louisiana State U. [Baton Rouge].
A GENERALIZED IBM 650 PROGRAM FOR CALCULATING MEASURES OF AVERAGE INFLUENCE AND CHANGE IN AGREEMENT OF RANKINGS BY A GROUP OF JUDGES, by Bernard M. Bass. Technical note no. 2, on Behavior in Groups, Contract N7onr-35609. Oct 60, 7p. 1 ref. AD-246 990.

DESCRIPTORS: *Digital computers, *Programming, *Group dynamics, *Behavior, Reasoning, Measurement, Attitudes, Computers.

A program of instructions is described for an IBM 650 for calculating the raw measures of average influence and change in agreement of rankings by a group of judges described previously. The basic data are these rank order judgments of a group of judges before and after they interact with each other. (Author)

PB 157 457 $13.50

Stanford Research Inst., Menlo Park, Calif.
DRUG ENHANCEMENT OF PERFORMANCE, by Nicholas Plotnikoff, Leon Otis (Johns Hopkins U.) and others. Final rept. on Contract Nonr-2993(00). 15 Sep 60, 197p. 397 refs. SRI Proj. no. SU-3024; AD-249 091.

DESCRIPTORS: *Stress (Psychology), *Drugs, *Stimulation, *Nervous system, Physiology, *Tranquilizing drugs, *Fatigue (Physiology), *Motor reactions, *Stress (Physiology), *Behavior, *Reaction (Psychology), Control, Biochemistry, Pharmacology, Tests.

The effects of stimulant drugs on changes in performance under states of stress and fatigue was investigated. The suggestion was made that baseline psychological parameters of measurement of motivation, emotion, learning, activity, physical performance, subjective effects, perception-cognition, and judgment under states of stress be delineated and defined. Second, neurophysiological correlates of the above performance changes should be sought by measuring neuronal recovery times, steady potential gradients, and the classical response parameters in the reticular activating, diffuse thalamic, and the limbic systems. Third, neurochemical correlates of changes in performance should be obtained by attempting to measure changes in the chemical properties of structural components and metabolite levels in the brain cells. Finally, pharmacological effects of new stimulants should be evaluated by measuring changes in performance, with the parameters outlined above as indices. In addition, active synthesis programs of new stimulants and derivatives, based on the above findings, should be initiated. (Author)

PB 158 069 $1.60

Washington U., St. Louis, Mo.
STRUCTURAL FACTORS AND INDIVIDUAL NEEDS IN GROUP BEHAVIOR, by Richard deCharms and Robert L. Hamblin. Annual technical rept. on Contract Nonr-816(11). Nov 60, 17p. 5 refs. AD-248 527

DESCRIPTORS: *Group dynamics, Sociometrics, *Needs, Sociology, Attitudes, Behavior

Contents:
Structural factors in group behavior
- The effects of balanced and imbalanced cross linkages
- Differential rewards, goal interlocking and productivity
- Punitive and close supervision

Individual needs in the group situation
- Studies in vicarious satisfaction IV: task completion and satisfaction
- The development of affiliation motivation
- Status, authoritarianism and impression formation
- Direct and vicarious verbal conditioning
- The effects of leadership compliance on group perception, motivation, and learning
- Motivational trends in school readers
- Motivational interferences from behavior

(See also PB 150 852)

PB 158 039 $3.60

American Inst. for Research, Santa Barbara, Calif.
AN ANALYSIS OF RESPONSE MODE AND FEEDBACK FACTORS IN AUTOMATED INSTRUCTION, by Robert A. Goldbeck and Leslie J. Briggs. Technical rept. no. 2 on Contract Nonr-3077(00). Nov 60, 39p. 7 refs. AIR-328-60-IR-133; AD-248 016.

DESCRIPTORS: *Learning, Automation, *Programming, Psychology, Behavior, Education, Memory, Theory, Training devices, Reading, Verbal behavior.

Contents:
Automated instruction and education
Avenues for continued improvements in programming
The foci of needed study
Response making and feedback
- Methods for producing desired responses
- Response frequency
- Response relevance
- Repetition
- Size of response segment
- Location in the frame
- Remoteness of prompts
- Response and feedback relationships
- Form of response
- Response difficulty
- Functions of feedback

Points of emphasis from project experimentation
Implications for educational practice
- Methods of programming
- Combining of molar and molecular approaches
- Programming and creativity
- Some unanswered questions of broad significance

PB 159 343 $2.60

New York State Coll. of Agriculture, Cornell U., Ithaca.
A MATHEMATICAL MODEL FOR LENGTHS AND MID-POINTS OF INVERSIONS IN CHROMOSOMES, by W. T. Federer, R. G. D. Steel, and Bruce Wallace. Technical rept. no. 3 on Contract Nonr-401(39). Jan 61, 24p. 1 ref; AD-250 161.

DESCRIPTORS: *Chromosomes, Genetics, Insects, Mitosis, Corn, Distribution, Mathematical analysis, Transformations (Mathematics).

The distribution of lengths of inversions and the first two moments of the distribution in chromosomes are obtained for two models. In addition, the distributions and moment generating functions are given for midpoints of inversions, midpoints of inversions for a fixed length of inversion, proximal breaks, and distal breaks for one of the models. Both least square and maximum likelihood estimators for the parameters of the second model for lengths of inversions are presented and exemplified with a numerical example. A relatively good fit was obtained even including the class of short inversions which are less than or equal to 5% of the length of the chromosome. A good share of possible short inversions may be lost as deletions, and hence the observed frequency in this class may be too low. (Author)

ORO-469 $1.10

Texas U., Austin.
RESEARCH IN MOLD METABOLISM. Final rept. on Contract AT(40-1)-1040. Oct 61, 5p.

Biochemistry

TID-14232 $9.60

Arizona U., Tucson.
THE BIOSYNTHESIS OF FATTY ACIDS IN FLAX EMBRYOS, LINUM USITATISSIMUM L, by Leslie F. Smith. Doctoral thesis. 1961, 112p. 58 refs.

TID-14243 $6.60

Arizona U., Tucson.
THE ROLE OF LIGHT IN THE SYNTHESIS OF LIPIDS IN FRUITS, by Abdul Wahab, Nadhim Showki, Jr. Doctorial thesis. Rept. on Contract AT(11-1)-262. 1960, 65p. 41 refs.

TID-14233 $1.60

Arizona U. Agricultural Experiment Station, Tucson.
THE SYNTHESIS OF FATTY ACIDS IN A HIGHER PLANT, by Edwin B. Kurtz, Jr. Final rept. 1 July 53-30 Apr 61, on Contract AT(11-1)-262. Nov 61, 11p.

TID-13030 $3.60

Johns Hopkins U. School of Hygiene and Public Health, Baltimore, Md.
BIOCHEMISTRY. Annual rept. 15 Sep 60-14 Sep 61, on Contract AT(30-1)-1371. June 61 39p.

PB 158 574 $1.60

Winifred Masterson Burke Relief Foundation, White Plains, N. Y.
PROTEIN AND AMINO ACID NUTRITION OF MAN IN HEALTH AND DISEASE, by Anthony A. Albanese. Annual progress rept. 1 Jan-31 Dec 60 on Contract Nonr-3145(00). 1 Dec 60, 13p. 9 refs. AD-247 725.

DESCRIPTORS: *Proteins, *Amino acids, *Nutrition, *Deficiency diseases, Diet, Cholesterol, Hormones, Metabolism, Steroids, Age factors, Control, Proteases, Linoleic acid, Inhibition

Contents:
Biochemical evaluation of low-cost corn oil product as a practical hypocholesterolemic agent
Investigation of effects of iron-amino acid complex, of Japanese origin, on anemias of the aged
Development of an integrated scoring method for the nutritional potency of hormonal and metabolic agents
Design of new instrumentation to improve accuracy and operation of ultra micro method for measurement of blood amino acids

PB 159 291 $1.60

College of Physicians and Surgeons. School of Dentistry, San Francisco, Calif.
RELATIONSHIP BETWEEN INFECTION AND PATHOLOGY IN THE PULP CANAL AND PERIAPICAL REGION, OR HYALURONIDASE PRODUCING MICROORGANISMS AND PERIAPICAL PATHOLOGY, by Lucile Schultz Smith. Final rept. for 1 Aug 55-31 Jan 61 on Contract Nonr-1791(00). [1961] 14p. 11 refs. AD-251 411.

DESCRIPTORS: *Oral bacteria, *Microorganisms, *Bacteria, *Teeth, *Enzymes, Pathology, Infections, Hyaluronidase, Fibrinolysin, Coagulases, Classification, Identification, Injuries, Proteases.

Ninety cases showing pulp pathology with and without periapical involvement were studied. Ninety-five strains of bacteria were obtained in pure culture from the root canals. They included: 41 strains of Corynebacterium, 24 Micrococcus, 12 Streptococcus, 7 Fusobacterium, 2 Veillonella, and one each of Vibrio, Bacteroides, Spirillum, Erysipelothrix, Neisseria, Lactobacillus, Bacillus, Pseudomonas, and Yeast. Each organism and combination of organisms isolated from any one tooth were tested for the production of enzymes. Fifteen produced alpha hemolysin, 36 beta hemolysin, 29 fibrinolysin, 4 coagulase, 24 hyaluronidase, and 12 proteolytic enzymes. Attempts to correlate the type of periapical radiolucency with the exoenzymes produced by organisms from the involved teeth showed that no one enzyme nor combination of enzymes were uniformly associated with a specific type of roentgenographic lesion. Neither was there any correlation between the enzyme or enzymes produced and the presence of root resorption. Fourteen strains of the Corynebacterium which grew only under microaerophilic conditions when isolated were trained to grow aerobically. (Author)

NYO-9645 $1.25

Perkin-Elmer Corp., Norwalk, Conn.
ATOMIC ENERGY COMMISSION BLOOD CELL SCANNER, by K. Preston, Jr. and N. F. Izzo. Final rept. on Contract AT(30-1)-2573. Sep 61, 49p.

Pharmacology and Toxicology

UCLA-491 $1.60

California U., Los Angeles. School of Medicine.
PHARMACOLOGY AND TOXICOLOGY OF NIOBIUM CHLORIDE, by Thomas J. Haley, N. Komesu, and K. Raymond. Rept. on Contract AT(04-1)-GEN-12. Oct 61, 12p. 9 refs.

UCLA-492 $1.60

California U., Los Angeles. School of Medicine.
THE TOXICOLOGICAL AND PHARMACOLOGICAL EFFECTS OF GADOLINIUM AND SAMARIUM CHLORIDES, by Thomas J. Haley, K. Raymond and others. Rept. on Contract AT(04-1)-GEN-12. Oct 61, 13p. 11 refs.

UCLA-487 $1.60

California U., Los Angeles. School of Medicine.
THE TOXICOLOGICAL AND PHARMACOLOGICAL EFFECTS OF HAFNIUM SALTS, by Thomas J. Haley, K. Raymond and others. Rept. on Contract AT(04-1)-GEN-12. Sep 61, 13p. 8 refs.

Radiobiology

ABCC-57-58 $2.00

Atomic Bomb Casualty Commission, Hiroshima and Nagasaki (Japan)
ATOMIC BOMB CASUALTY COMMISSION. Annual rept. 1 July 57-30 June 58. 81p.

UCLA-455 $1.60

California U., Los Angeles. School of Medicine.
X-IRRADIATION PROTECTION STUDIES. I. DOSE RATE EFFECT AND STATISTICAL DETERMINATION OF SIGNIFICANCE IN SURVIVAL TIME CURVES, by James L. Leitch. Mar 60, 17p. 12 refs.

HW-SA-2302 $1.60

Hanford Atomic Products Operation, Richland, Wash.
EFFECTS OF THE ADMINISTRATION OF SINGLE DOSES OF I^{131} TO SHEEP OF VARIOUS AGES, by S. Marks, L. J. Seigneur and others. Rept. on Contract AT(45-1)-1350. Nov 61, 14p.

TID-12787 $1.10

Jefferson Medical Coll., Philadelphia, Pa.
THE EFFECT OF EMBRYONIC IRRADIATION ON ADULT LIFE EXPECTANCY AND ADULT PATHOLOGY. Progress rept. July 60-June 61, on Contract AT-10(30-1)-2071. 7p.

UCRL-9897 $3.00

Lawrence Radiation Lab., U. of California, Berkeley.
BIOLOGY AND MEDICINE, ed. by John H. Lawrence and Antreen Pfau. Semiannual rept. fall 61, on Contract W-7405-eng-48. Oct 61, 229p. 292 refs.

UR-603 $1.60

Rochester U. School of Medicine and Dentistry, N.Y.
RESPONSE OF MICROWAVE TREATED DOGS TO IONIZING RADIATION, by R. A. E. Thomson, W. J. Quinlan and others. Rept. on Contract W-7401-eng-49. Sep 61, 13p.

CHEMISTRY

PB 181 095 $2.00

John Harrison Lab. of Chemistry, U. of Pennsylvania, Philadelphia.
CHEMISTRY OF THE LIGHTER ELEMENTS, by E. Charles Evers. Final rept. on Contract Nonr-551(21). 30 Dec 60, 71p. 26 refs. AD-252 094.

DESCRIPTORS: *Silanes, *Silicon compounds, *Boron compounds, *Phosphorus compounds, Phosphines, Chemical properties, Chemical reactions, Polymers, Chemical bonds, Aluminum compounds, Fluorides, Diboranes, Phosphites.

Contents:
Compound bearing the Al-O-Si bond
The interaction of B2H6 and boron halides with silyl cyanides
Simple and polymeric substances bearing the Si-P bond
Reaction of chlorosilanes with alkali metal hydrogen phosphides-experimental
Dehydrohalogenation reactions-experimental
Reactions of silyl chlorides and elemental phosphorus-experimental
Pyrolytic dehydrogenation reactions-experimental
Interaction of B2H6 and BF3 with trialkyl phosphites
Interaction of B2H6 and trialkylphosphites
Interaction at BF3 and trimethyl phosphites
Interaction of B2H6 and cyanophosphites
Miscellaneous studies
Reaction of B10H14 with NH3 and Na
Dialkylborino phosphines
Studies on BP12

PB 157 609 $5.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
INORGANIC POLYMERS CONTAINING COORDINATED SPECIES, by B. P. Block, G. Barth-Wehrenalp and others. Technical rept. no. 19 on Contract Nonr-2687(00). Oct 60, 56p. 21 refs. AD-245 818.

DESCRIPTORS: *Polymers, *Metalorganic compounds, Synthesis, Polymerization, Inorganic substances, *Chemical bonds.

After the rationale for the selection of beryllium, chromium, and zinc as promising central elements is outlined, possible mechanisms for formation of coordination polymers both by condensation and addition processes are discussed. Types of polymers, classified by coordination number and charge type of ligands and catenating groups, are then considered. Systems investigated include beryllium with 2, 4-pentanedione and diphenylphosphinic acid, with 2, 5-dihydroxy-p-benzoquinone, and with salicylic acid and p-phenylenediamine, dimethylsulfone, or N-methyl-N'-phenyldiimidedioxide; zinc with 2, 4-pentanedione and diphenylphosphinic acid or cyanide, with benzaldehyde or 8-quinolinol and cyanide, with 2, 5-dihydroxy-p-benzoquinone, with dithioxamides, with iminodipyridine and oxide, diphenylsilanediol, phenylphosphonic acid, or methanedisulfonic acid, and with ammonia and chloride; and chromium with

2, 4-pentanedione and diphenylphosphinic acid, cyanide, 2, 5-dihydroxy-p-benzoquinone, or iminodipyridine and phenylphosphonic acid. Some compositions have been obtained which approximate those of the postulated polymers, and preliminary evaluation is underway. Most interesting are the diphenylphosphinic acid systems and monoammine zinc chloride. (Author)

Analytical Chemistry

ORNL-TM-64 $1.10

Oak Ridge National Lab., Tenn.
NON-DESTRUCTIVE ANALYSIS OF URANIUM IN GRAPHITE FUEL ELEMENTS BY NEUTRON ACTIVATION, by L. C. Bate, W. J. Hampton, and G. W. Leddicotte. Nov 61, 6p. 4 refs.

TID-13676 $11.00

Vienna U. (Austria)
ION EXCHANGE SEPARATION OF URANIUM AND THORIUM IN NON-AQUEOUS AND MIXED MEDIA. Oct 61, 148p.

Organic Chemistry

PB 159 462 $1.60

Cobb Chemical Lab., U. of Virginia, Charlottesville.
INVESTIGATION OF CONJUGATED SYSTEMS FOUND IN UNSATURATED MONO AND POLYCARBONYL COMPOUNDS, by Robert E. Lutz. Final rept. 15 June 53-14 June 59, on Contract DA 36-034-ORD-1283. 10 Sep 59, 13p. 11 refs. AROD rept. no. 745:15; AD-228 407.

DESCRIPTORS: *Carbonyl radicals, *Ketones, *Aldehydes, Molecular structure, *Stereochemistry, Chalcones, Monocyclic compounds, Synthesis.

Conjugated systems in unsaturated mono and polycarbonyl compounds were investigated where the carbonyls are ketone, aldehyde, carboxyl, carbamido, and related groups. The studies included (1) the synthesis and proof of structures and stereochemical configurations of compounds of the above types; (2) the effect of substituents, especially aryl groups, on steric interferences and on deviations from the overall planarity and effective conjugation of the resonating systems involved; (3) the effect of configuration and of deviations from planarity on the relative and directional reactivities of the whole or parts of the conjugated systems; (4) the influence of space relationships and deviations from planarity on cyclization and ring-chain tautomerism through the functional groups.

UCRL-9900 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
BIO-ORGANIC CHEMISTRY. Quarterly rept. June-Aug 61, on Contract W-7405-eng-48. Oct 61, 88p.

PB 181 107 $0.50

Physics Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
ORGANIC PERCHLORATE ESTERS, by Jack Radell and J. W. Connolly (Aeronautical Research Lab., Air Force Research Div.). Rept. for June 60-Feb 61 on Chemistry and Physics of Materials, Contract AF 33(616)5937. May 61, 14p. 11 refs. ASD Technical rept. 61-109.

DESCRIPTORS: Silver compounds, *Perchlorates, *Esters, Alkyl radicals, Infrared spectroscopy, Physical properties, Preparation, Dehydration, Stability, X-ray diffraction analysis.

The previously unreported n-amyl, n-hexyl, n-heptyl and n-octyl perchlorates were prepared from the corresponding alkyl iodide and silver perchlorate. The pure perchlorate esters were stabilized as the endocyte of a urea inclusion compound. The infrared spectra and some physical properties are reported for the n-alkyl perchlorates. (Author)

SC-4655(RR) $0.75

Sandia Corp., Albuquerque, N. Mex.
IRREDUCIBLE REPRESENTATIONS OF LINE GROUPS. THE DYNAMICS OF POLYMER CHAINS, by Katheryn E. Lawson and G. A. Crosby. Dec 61, 31p. 10 refs.

Physical Chemistry

PB 157 540 $8.60

Electrochemistry Research Lab., Western Reserve U., Cleveland, Ohio.
THE MEASUREMENT OF POLARIZATION, by Ernest Yeager. Technical rept. no. 13 on Contract Nonr-2391(00). 1 Sep 60, 93p. 64 refs. AD-246 363.

DESCRIPTORS: *Polarization, Measurement, *Electrochemistry, *Electrolytic cells

Various steady state and non-steady state techniques for the measurement of polarization are summarized in terms of basic features of each method, types of equipment required for each, and relative advantages and disadvantages in terms of particular types of applications. A discussion is presented of direct and indirect steady state techniques and of potentiostatic, galvanostatic, and double-pulse step function techniques, as well as impedance measurement, Faradic rectification, and a polarographic method. The methods are compared and an investigation is made of specific aspects of polarization measurements including control of impurities, purification procedures, electrodes, and the construction of a polarization cell.

PB 158 555 $5.60

Electrochemistry Research Lab., Western Reserve U., Cleveland, Ohio.
THE SODIUM AMALGAM-OXYGEN CONTINUOUS FEED CELL, by Ernest Yeager. Technical rept. no. 14 on Contract Nonr-2391(00). Dec 60, 52p. 12 refs; AD-248 803.

DESCRIPTORS: Anodes (Electrolytic cell) Cathodes (Electrolytic cell), Hydroxides, *Electrolytic cells, *Electrochemistry, Polarization, Oxygen electrodes, Mercury alloys, Steel electrodes, Electrolytes, Sodium compounds, Sodium alloys.

The anode of the sodium amalgam-oxygen continuous feed cell consists of a vertical steel electrode with liquid amalgam flowing continuously down its surface. Porous carbon electrodes of the semi-lyophobic type have been used as the cathode. The amalgam is produced external to the cell by introducing sodium directly into mercury. The overall cell reaction is $4\,Na + O_2 + 2\,H_2O$ to 4 NaOH. Performance characteristics are reported for a small single cell laboratory unit as well as a five-cell unit of several hundred watts capacity. (Author)

AD-265 510 repriced $2.50

Gas Dynamics Lab., Northwestern U., Evanston, Ill.
THE EFFECT OF RECOMBINATION RATE ON THE FLOW OF DISSOCIATING DIATOMIC GAS, by Thomas P. Anderson. Rept. on Contract AF 40(600)748. Sep 61, 106p. 38 refs. AEDC-TR-61-12.

DESCRIPTORS: *Gas flow, *Gases, Dissociation, *Recombination reactions, Chemical reactions, Thermodynamics, Exhaust nozzles, Nozzles, *Oxygen, Analog computers, Computers, Scheduling.

The flow of a chemically reacting gas through a divergent nozzle is considered. A pure diatomic gas is assumed to dissociate and recombine according to seven distinct recombination rate laws. The effect of correcting Lighthill's "ideal dissociating gas" for vibrational contributions of the molecular species and translational contributions of the atomic species is shown to be small. The effect of recombination rate on the flow of oxygen, from throat conditions of 2 atm and 4050 K, is shown to be significant for reaction rates decreasing with temperature and relatively unimportant for reaction rates increasing with temperature. Electronic analog computer solutions are presented for a variety of throat compositions and recombination rates. (Author)

PB 158 618 $4.60

Honeywell Research Center, Hopkins, Minn.
THE FRACTURE BEHAVIOUR OF SILVER CHLORIDE ALUMINA COMPOSITES, by T. L. Johnston, R. J. Stokes, and C. H. Li. Technical rept. no. 11 on Contract Nonr-2456(00). Dec 60, 43p. 13 refs. HR-60-564; AD-248 958.

DESCRIPTORS: Tests, Mechanical properties, Powder metallurgy, *Chlorides, Stresses, *Silver compounds, Impact shock, Oxides, Hydrostatic pressure, *Fracture (Mechanics), Diffusion, Extrusion, Lattices,

The effect of alumina particles on the nucleation and growth of cracks through silver chloride matrix has been investigated. It has been found possible to promote fibrous cracking in dispersion-strengthened silver chloride under notch-impact conditions at temperatures at which silver chloride alone cleaves brittlely. The modification of fracture behavior is thought to be due to the relaxation of hydrostatic stress beneath a notch by the nucleation of cavities near alumina particles. (Author)

PB 159 269 $1.60

Louisiana State U., Baton Rouge.
FARADAIC RECTIFICATION AND ELECTRODE PROCESSES. II, by Mitsugi Senda, Hiedo Imai, and Paul Delahay. Technical rept. no. 43 on Contract Nonr-300(00). Jan 61, 16p. 6 refs. AD-253 405.

DESCRIPTORS: *Electrodes, *Electrochemistry, *Electrolysis, *Electrolytes, *Rectifiers, Mercury electrodes, *Voltage, Measurement, Electric potential, Alternating current, Resistance, Electrical double layer, Circuits.

The correlation between the mean rectification voltage and mean rectification current and the influence of the circuit resistance are discussed quantitatively. A double pulse method is described in which the time for charging of the double layer is decreased and the drift of potential due to heating of the electrolyte is minimized at very high frequencies. (Author) (See also PB 150 967)

ORNL-3228 $0.50

Oak Ridge National Lab., Tenn.
ADSORPTION OF KRYPTON AND XENON BY VARIOUS MATERIALS, by M. H. Lloyd and R. A. McNees. Rept. on Contract W-7405-eng-26. [1961] 19p.

ORNL-3091 $9.60

Oak Ridge National Lab., Tenn.
DIFFUSION OF SLOW ELECTRONS IN GASES, by D. W. Forester and L. W. Cochran. Rept. on Contract W-7405-eng-26. Oct 61, 115p. 16 refs.

ORNL-3236 $0.50

Oak Ridge National Lab., Tenn.
MEASUREMENT OF THE VAPOR PRESSURE OF TBP, by A. Faure and W. Davis, Jr. [1961] 14p. 7 refs.

PB 157 409 $1.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
TECHNIQUES FOR THE PREPARATION AND STUDY OF CHROMIUM (II) COMPOUNDS, by L. R. Ocone and B. P. Block. Technical rept. no. 18 on Contract Nonr-2687(00). [1960] 18p. 7 refs. AD-250 024.

DESCRIPTORS: *Chromium compounds, Oxygen, Oxidizers, Laboratory equipment, Chlorine, Chemical reactions, Acetates, Synthesis, Preparation, Test methods.

A system was devised for handling compounds sensitive to air and moisture, particularly chromous acetate and chromous acetylacetonate. The heart of the apparatus was an in-line filter made by attaching a spherical joint to the mouth of a fritted-glass filter funnel, and a stopcock and small standard taper joint to the stem. A deep-red powder prepared by the re-

action of chromous chloride with sodium acetate appears to be the monohydrate of chromium acetate which changes to the anhydrous material on heating. Chromous acetylacetonate was prepared by reacting fresh chromous acetate and acetylacetone. The properties of chromous acetate and acetylacetonate were studied either by conducting further reactions in the capped filter chamber or by transferring the material to a vacuum system. The reactions with oxidizing agents were investigated. Cyanogen reacted very slowly with the acetonate. Concentrated Cl reacted with the anhydrous compounds to form liquids containing chlorinated aldehydic or ketonic substances. Very dilute Cl reacted to form green, dry powder which after prolonged chlorination darkened and appeared moist.

TID-13667 $1.10

Pennsylvania State U., University Park.
THERMOCHEMISTRY OF PRECIPITATION AND "LIQUID STRUCTURE" IN MOLTEN NITRATES, by Joseph Jordan and E. J. Billingham, Jr. (Thiel Coll., Greenville, Pa.) Sep 61, 5p.

PB 158 875 $2.60

Plastics Lab., Princeton U., N. J.
FACTORS AFFECTING SEPARATIONS OF SUSPENSIONS IN NON-UNIFORM ELECTRIC FIELDS, by H. A. Pohl and J. P. Schwar. Rept. 11a on Contract DA 36-039-sc-70154. 1 May 58, 22p. 2 refs. Technical rept. 50A.

DESCRIPTORS: *Polymers, Particles, Powders, Vinyl chlorides, Liquids, Carbon tetrachloride, Benzenes, Separation, *Electrophoresis, *Dielectrics, *Electric fields, Electrodes, Polarization

A study of the more quantitative aspects of the behavior of suspended polymer particles in a real dielectric is presented.

PB 158 588 $1.10

St Louis U., Mo.
SYNTHESIS AND REACTIONS OF CYCLIC BORON-NITROGEN COMPOUNDS, by Leo F. Hohnstedt and Angelo M. Pellicciotto. Technical rept. no. 2 on Contract Nonr-2793(00). 31 Dec 60, 7p. 19 refs.

DESCRIPTORS: Ethyleneamines, Borohydrides, *Boron compounds, *Chemical reactions, *Polycyclic compounds, Nitrogen compounds, Phenyl radicals, Synthesis, Chlorides, Sodium compounds, Amines.

The products of the reaction of BCl_3 with o-phenylene diamine dihydrochloride were investigated. One product, to which the empirical formula $C_6H_7N_2BCl_3$ was assigned, was reacted with $NaBH_4$, to form a possible adduct of tetrehydrofuran and benzodrazaboroline. $NaBH_4$ was further reached with o-phenylenediamine dihydrochloride and ethylenediamine dihydrochloride. The reaction of BCl_3 with ethylenediamine dihydrochloride gave a solid material which melted at 173 to 175 C. The reaction of BCl_3 with 1, 2-diaminopropane dihydrochloride was also studied.

PB 159 374 $5.60

Columbia U., New York.
OBJECTIVE AND QUANTITATIVE FIELD METHODS OF TERRAIN ANALYSIS, by Arthur N. Strahler and Donaldson Koons. Final rept. on Contract Nonr-266(50). 1960, 53p. 10 refs. AD-251 802.

DESCRIPTORS: *Terrain, Geography, Surface properties, *Geology, Soils, Sampling, Trees, Classification, Maine.

Objective, quantitative terrain analysis useful in military and engineering applications measures purely physical properties of the ground surface. To evaluate ease of dispersed cross-country movement on foot or in vehicles, an element of ground surface may be analyzed in terms of resistive forces set up by ground slope, surface roughness, vegetative density, and soil weakness. Inhibition of movement depends upon the sum of these resistive forces weighted on a performance basis. A summer field sampling program in central Maine provided data on mean values and variances for within-area and between-area analysis of four basically different terrain types with a wide range of geological properties: (A) bouldery thin till on granitic bedrock with deciduous forest, (B) bog on clay with mixed deciduous and hemlock forest, (C) sand plain with pine forest, and (D) bouldery thin till with mature hemlock forest. Roughness, or micro-relief, was sampled on random 100-ft transit lines with a logarithmically-scaled level rod, measuring all height differences greater than 0.1 ft. Trunk diameter and tree frequency were measured in 40-ft sample circles located by random azimuths and distances. Resistance of surficial soil to shearing was sampled uniformly along the transit lines by Proctor penetrometer and Corps of Engineers cone penetrometer. Determinations of remolding index, bulk density, field moisture content, organic content, and grain-size distribution provided additional soils data. (Author)

PB 159 373 $9.10

Columbia U., New York.
QUANTITATIVE GEOMORPHOLOGY OF THE SAN DIMAS EXPERIMENTAL FOREST, CALIFORNIA, by James C. Maxwell. Technical rept. no. 19 on Contracts N6onr-271(30) and Nonr-266(50). 1960, 107p. 56 refs. AD-251 801.

DESCRIPTORS: *Terrain, Trees, *Geological survey, Surface properties, Mountains, *Hydrology, California, Aerial reconnaissance.

Methods of quantitative geomorphology, developed in regions of humid climate and moderate relief, were tested for applicability to mountainous terrain in five fifth-order watersheds in the San Dimas Experimental Forest, San Gabriel Mountains, southern California. Deep canyons, rocky cliffs, sharp-crested ridges and many waterfalls 5 to 50 ft high typify these watersheds. Their dense chaparral vegetation consists largely of chamise, sage, ceanothus, manzanita, and oak, which were grouped in ten associations and areally mapped. Rainfall totals 20 to 40 in. mostly from a few intense

winter storms; summers are hot and dry. Stony residual soils are generally less than 3 ft deep. Bedrock of gneiss, schist, metadiorite, and granite, intermingled, is deeply weathered, friable to depths exceeding 50 ft in places, and fractured by many faults of small displacement. Over-steepened inner canyon walls, entrenched meanders, and knick-point waterfalls indicate recent rejuvenation. (Author)

PB 157 395 $2.60

Electrical Engineering Research Lab., U. of Texas, Austin.
DIRECTIONAL PROPERTIES AND PHASE RELATIONS OF THE MAGNETOTELLURIC FIELDS AT AUSTIN, TEXAS, by H. W. Smith, L. D. Provazek, and F. X. Bostick, Jr. Rept. on Contract Nonr-375(01). 10 Oct 60, 23p. 14 refs. Rept. no. 116; AD-245 507.

DESCRIPTORS: Magnetic fields, Electric fields, *Terrestrial magnetism, Texas, Magnetic recording systems, *Magnetic laboratories, Wave analysis.

Directional properties and time phase relations of the variable electric and magnetic field components of selected data samples taken at Austin, Texas are presented. Data recording and analysis techniques are described and illustrated for the selected data samples. (Author)

PB 159 260 $1.60

Weizmann Inst. (Israel).
COMPARISON OF THEORETICAL WITH OBSERVED VALUES OF THE PERIODS OF FREE OSCILLATION OF THE EARTH, by C. L. Pekeris, Z. Alterman, and H. Jarosch. Interim rept. on Contract Nonr-1823(00). Jan 61, 16p. 19 refs. AD-249 947.

DESCRIPTORS: Earth, Oscillation, Earthquakes, Recording devices, Seismographs, Gravimetric analysis, *Earth models, *Seismic waves, Theory

The theoretical values of the periods of free oscillation of the earth, in both the spheroidal and torsional modes, are compared with the experimental values from seismograms (52 periods) and from gravimetric records (49 periods) of the Chilean earthquake of May 1960. Two models of the earth are considered: model Bullen B and the Gutenberg model, the latter being characterized by the occurrence of a low velocity layer at a depth of about 150 km. The periods deduced from power-spectra analyses of the seismic and gravimetric records are in mutual agreement to within 1%. The theoretical periods of spheroidal oscillations for the Gutenberg model agree with the observed values to within 1%, and this is true also for model Bullen B at periods less than 5 minutes. In the period-range of 5 to 11 min, the observed values are systematically lower by about 2% than the Bullen B values, thus favoring the Gutenberg model. As expected on theoretical grounds, no torsional oscillations were found in the spectrum of the gravimetric records. The torsional oscillations recorded on the seismograms agree in period to within 1% with both the Bullen B and Gutenberg values, except for the n equals 2 mode, which was recorded weakly. An order-of-magnitude argument is presented in support of the hypothesis of the rotational origin of the frequency splitting of the free oscillations of the earth. (Author)

Climatology and Meteorology

ANL-6444 $0.50

Argonne National Lab., Ill.
WEATHER MODIFICATION, by M. B. Rodin and D. C. Hess. Rept. on Contract W-31-109-eng-38. Dec 61, 18p.

PB 159 287 $1.10

New York U. Coll. of Engineering, N. Y.
[STUDY OF THE PRODUCTION OF NEUTRONS BY THE COSMIC RADIATION, AND THEIR SUBSEQUENT HISTORY] by Serge A. Korff. Final rept. on Contract Nonr-285(21). 1 Jan 61, 7p. 32 refs. AD-248 808.

DESCRIPTORS: *Meteorological balloons, *Cosmic rays, Distribution, Energy, Measurement, Production, Particles, *Neutrons.

A study was made of the production of neutrons by cosmic radiation, and their subsequent history. To this end a series of high altitude balloon flights was carried out, as well as some sea-level observations and associated theoretical studies. The study involved experiments at various levels in the atmosphere. The level at which highest numbers of neutrons is encountered is around 60,000 ft, the exact level of the maximum depending on latitude. The use of Skyhook balloons for the program was therefore indicated. The energy distribution of the neutrons was measured, by flying counters with shields arranged to be sensitive to neutrons of varying energies. The time constancy of the neutron production rates was also measured. It was found that the rate of neutron production at high elevations varies considerably, with the state of the sunspot cycle and depending on whether the earth is intercepting swarms of particles of solar origin. Correlations were noted with other geophysical phenomena such as geomagnetism, aurorae, and ionospheric radio wave propagation. Fluctuations in any one of these parameters often correlated with changes in the others. (Author)

Frost Science

PB 158 628 $3.60

American Geographical Society, New York.
GLACIOLOGICAL AND RELATED STUDIES OF LEMON CREEK GLACIER, ALASKA, by Calvin J. Heusser and Melvin G. Marcus. Final rept. on Juneau Ice Field Research Project, Contract N9onr-83001. 1960, 40p. 47 refs. AD-250 367.

DESCRIPTORS: *Glaciers, *Ice, Measurement, Meteorology, *Hydrology, Alaska.

Data collected on the glacier between 1953 and 1958 are analyzed and interpreted. Particular emphasis is placed on the 1958 field season. The glacier's variations during the 1900's are explained on the basis of available meteorological records. With the aid of additional 1958 movement and hydrological data, Nielsens equations for the equilibrium glacier are tested.

PB 157 602 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
EXCAVATIONS IN FROZEN GROUND: CRITICAL DEPTH SHOTS (100 AND 500 LB) IN FORT CHURCHILL TILL, by Robert Benert. Jan 61, 11p. 2 refs. Technical rept. 79.

DESCRIPTORS: *Permafrost, *Explosives, Penetration, Blast, Tests, Canada, *Underground explosions, Explosions.

Tests were conducted from Feb-March 1956 at Fort Churchill (Canada) to determine if the critical depth curve obtained earlier for small charges (0.5-20 lb) could be extrapolated for larger charges. The results, based on firings of three 100-lb and four 500-lb charges of Atlas 60% gelatin dynamite, indicate that the definition for critical depth must be revised for the larger charges if the extrapolation is to be valid. (Author)

PB 157 601 $9.10

Barodynamics, Inc. Georgetown, Colo.
BOMB PENETRATION TESTS, FORT CHURCHILL, CANADA, by Clifton W. Livingston. Final rept. on Penetration of Projectile Into Frozen Ground, Contract DA 11-190-eng-22. Sep 60, 110p. 8 refs. SIPRE Technical rept. 71.

DESCRIPTORS: *Permafrost, *Explosives, Bombs, Penetration, Blast, Tests, Canada.

Inert mortar shells and inert general-purpose, semi-armor-piercing, and armor-piercing bombs were dropped on frozen ground (glacial till) near Fort Churchill (Can.) during the 1956-57 winter to observe projectile penetration and determine the feasibility of forming trenches and foxholes in frozen ground with aerial bombs. Projectiles ranging from 81-mm mortar shells to 1600 AP bombs were dropped from altitudes of 2000-24,500 ft. Although the evidence suggests that the laws for penetration by pure brittle-state failure differ from the laws for penetration by plastic deformation, it seems possible to correlate the behavior of a wide range of materials under impact of projectiles by a postulated model law for impact. An analogy is drawn between plastic deformation and fluid flow, and an equation is derived which expresses the path length of a bomb penetrating a solid in terms of the weight and diam of the bomb, the density and unit weight of the material penetrated, and two coefficients which are related to the material and its resistance to bomb penetration. Using the plastic deformation equation and the postulated model law for impact, equations are derived for predicting the type of fracturing, the degree of fragmentation, and the shape of the underground trajectory. (Author)

Geology

RME-4535(Rev.) $0.50

Atomic Energy Commission. Div. of Raw Materials, Washington, D. C.
RECONNAISSANCE FOR URANIUM IN THE ANTOFAGASTA AREA, PROVINCE OF ANTOFAGASTA, CHILE, by Paul H. Knowles, William A. Bowes and others. Apr 61, 18p. In cooperation with Instituto de Investigaciones Geologicas, Santiago, Chile.

TEM-943 $0.50

Geological Survey, Washington, D. C.
RECONNAISSANCE FOR URANIUM IN THE COAL OF SAO PAULO, SANTA CATARINA, AND RIO GRANDE DO SUL, BRAZIL, by Donald D. Haynes, Charles T. Pierson, and Max G. White. Jan 58, 18p. 17 refs.

UCRL-6438(Pts. I & II) $5.50

Lawrence Radiation Lab., U. of California, Livermore.
PROCEEDINGS OF THE GEOPHYSICAL LABORATORY - LAWRENCE RADIATION LABORATORY CRATERING SYMPOSIUM. Held at the Geophysical Laboratory of the Carnegie Institute, Washington, D.C., March 28-29, 1961, ed. by Milo D. Nordyke. Rept. on Contract W-7405-eng-48. Oct 61, 474p.

Physics of the Atmosphere

PB 159 466 $3.60

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
THE MEASUREMENT OF THE ATMOSPHERIC AMBIENT TEMPERATURE FOR MISSILE FLIGHT ANALYSIS, PARTICULARLY AT THE ATLANTIC MISSILE RANGE, by Gerhard H. R. Reisig. 10 Nov 60, 38p. 30 refs. Rept. no. RR-TR-2-60; AD-248 539.

DESCRIPTORS: *Atmosphere, Temperature, Measurement, *Atmospheric sounding, Florida, Guided missiles, Flight paths, Radiosondes, Atlantic Ocean, Analysis

An analysis has been carried out investigating the determination of atmospheric temperatures for missile flight analysis purposes. Direct measurement of atmospheric temperature along the flight path of a missile is not possible; therefore, extra-missile measuring methods, as represented by radiosonde ascents, are being used. The mean instrument error of the routine radiosonde model stays below $1^{\circ}C$ absolute for all practical radiosonde altitudes. However, the total error of temperature determination at constant altitude level is composed of the instrumental inaccuracy of the temperature measurements and an error of miscoordination of radiosonde and missile heights. Another larger addition to the temperature error of radiosondes, which is about twice the mean instrument error from a 16,000 m altitude upwards, is contributed by the "heat noise" of the atmosphere. The total relative mean temperature error from radiosonde measurements as applied to missile flight analysis at the Atlantic Missile Range, amounts to less than 1 percent up to about a 25,000 m altitude but increases to 1.7 percent at about a 34,500 m altitude because of poor radiosonde height qualities.

PB 159 464 $8.10

Reconnaissance Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
INFRARED HYGROMETRY AS DEMOSTRATED BY TESTS OF DEWPOINT MEASURING SETS, AN/AMQ-14(XH-1), by J. M. Francis, Jr., N. W. Mason, and W. A. Maxim. Rept. on General Atmospheric Reconnaissance Techniques, Contracts AF 33(600)30790 and AF 33(600)25620. Jan 61, 85p. 11 refs. WADD Technical note 60-272; AD-253 206.

DESCRIPTORS: *Atmosphere, High altitude, *Water vapor, Measurement, *Hygrometers, Design, Dew point, Infrared equipment.

The state of the art in infrared hygrometry is presented. The AN/AMQ-14 (XH-1) Dewpoint Measuring Sets were developed to measure water-vapor concentration at dewpoint temperatures of -60C to + 35 C. Repeatability to within + or - 1 C above -40 C and + or -2 C below -40 C was demonstrated in tests. Desirable characteristics include rapid response, wide measurement range, and continuous indication of dewpoint. Problem areas, include zero drift, warm-up drift, deviations in voltage, heat dissipation, and deterioration with time and use. Recommended future development to correct some of these problem areas is outlined, and detailed operating instructions are provided. The infrared technique appears highly promising for measuring the water-vapor concentration at low dewpoint temperatures. (Author)

ENGINEERING

PB 181 108 $3.50

Cryogenic Engineering Lab., National Bureau of Standards, Boulder, Colo.
OPTIMUM DESIGN OF LIQUID OXYGEN CONTAINERS, by Robert W. Arnett, Keith A. Warren, and Lewis O. Mullen. Rept. on Contract AF 33(616)56-15. Aug 61, 247p. 73 refs. WADC Technical rept. 59-62.

DESCRIPTORS: *Oxygen, *Liquefied gases, Gases, *Containers, Design, Materials, Physical properties, Mechanical properties, Construction, Tests, Storage tanks

The basic parameters influencing the design of liquid oxygen containers are considered and their design in interrelation evaluated. Factors considered include materials, configuration, insulation, support members, instrumentation, valves, piping, weight, evaporation loss, and accessory items such as vacuum pumps and transfer hoses. Means for evaluating and optimizing the combination of the various factors are presented together with experimental work conducted in areas where information was lacking. Description of the design and construction of a liquid oxygen container together with the thermal test results on the container is included. (Author)

SCR-303 $2.25

Sandia Corp., Albuquerque, N. Mex.
TECHNICAL ANALYSIS AND DEFINITION: A FIELD OF ENGINEERING STUDY, by C. S. Wolowicz, C. P. Rindone, and R. J. Wilcox. Dec 61, 117p.

Aeronautical Engineering

AD-265 941 repriced $2.75

Princeton U., N. J.
A NEW FACILITY FOR THE STUDY OF AIRCRAFT DYNAMICS, by E. Martinez. Rept. on Contract DA 44-177-tc-524. July 61, 146p. 13 refs. Rept. no. 532.

DESCRIPTORS: *Helicopters, *Vertical take-off planes, Aircraft, *Ground effect, *Machines, *Flight testing, *Test facilities, Airplane models, Model tests.

This report has a twofold purpose. The first is to acquaint the helicopter and vertical-take-off-and-landing engineer and designer with the use of this new model flight facility as an effective and practical tool by means of which he can economically evaluate, modify, and perfect his designs. The second one is to present the design philosophy and the experience accumulated during its development in order to provide the basis on which, in the future, other, perhaps more sophisticated facilities of this nature can be designed and constructed.

PB 159 301 $6.60

Winzen Research, Inc., Minneapolis, Minn.
STRATO-LAB HIGH #2 POST FLIGHT REPORT, by Donald L. Foster. Rept. on Contract Nonr-1460(08). 19 Jan 61, 64p. 6 refs. Rept. no. 1266-R; AD-250 991.

DESCRIPTORS: Gondolas, *Balloon gondolas, *Balloons, Stratosphere, Space flight, Space capsules, Spaceship cabins, *Pressurized cabins, Oxygen equipment, Airborne, Meteorology.

The STRATO-LAB HIGH #2 flight was launched from the Feigh open pitt iron mine near Crosby, Minnesota. The balloon-gondola system rose to a ceiling altitude of 86,000 ft. where it remained for a period of 3 hr before decent was initiated. The sealed cabin system used for this flight was the same basic unit which had been used for the initial STRATO-LAB HIGH flight. The renovated gondola was suspended below the two million cubic foot aerostat by means of a 64-ft diameter cargo parachute which was flown in an extended configuration. Although souvenir hunters stripped the gondola of most of its equipment before it could be removed from the landing site, nearly all of the equipment was subsequently recovered. This flight gave added evidence of the value and flexibility of the plastic balloon-manned gondola system for use in the furtherance of scientific research at altitudes above most of the earth s atmosphere. In the process of accomplishing its primary flight objectives, this flight also established an unofficial world altitude record for a two-man flight. (Author)

Chemical Engineering

TID-14227 $1.60

Anderson Physical Lab., Champaign, Ill.
ZONE MELTING. DISTILLATION OF KCl. Technical rept. no. 17 (progress) on Contract AT(11-1)-544. Oct 61, 12p.

NYO-9848 $1.60

Consolidation Coal Co., Library, Pa.
UTILIZATION OF RADIOACTIVE ISOTOPES IN COAL PROCESS RESEARCH, by P. M. Yavorsky and E. Gorin. Quarterly status rept. no. 9, 1 June-31 Aug 61, on Contract AT(30-1)-2350. Oct 61, 20p.

TID-14189 $1.60

Minnesota U., Minneapolis.
THEORETICAL INVESTIGATION OF FLOW THROUGH AN APERTURE SOLUTION OF THE TWO-PHASE COMPRESSIBLE FLOW BY THE "HODOGRAPH TRANSFORMATION", by G. Gavalas. 18 Oct 61, 15p.

ORNL-3217 $2.60

Oak Ridge National Lab., Tenn.
A LARGE-SCALE GETTER PUMPING EXPERIMENT USING VAPOR DEPOSITED TITANIUM FILMS, by R. E. Clausing. Rept. on Contract W-7405-eng-26. Nov 61, 28p.

ORNL-3186 $1.00

Oak Ridge National Lab., Tenn.
PROCESSES FOR RECOVERY OF URANIUM AND THORIUM FROM GRAPHITE-BASE FUEL ELEMENTS. PART II, by L. M. Ferris, A. H. Kibbey, and M. J. Bradley. Rept. on Contract W-7405-eng-26. 36p. 49 refs.

ORNL-3203 $0.50

Oak Ridge National Lab., Tenn.
PURIFICATION OF DEGRADED TRIBUTYL PHOSPHATE-HYDROCARBON DILUENT SOLUTIONS BY DISTILLATION: STATUS SUMMARY, by W. Davis, Jr. Rept. on Contract W-7405-eng-26. [1961] 14p. 12 refs.

ORNL-3187 $0.50

Oak Ridge National Lab., Tenn.
TITANIUM PUMP LOOP FOR AQUEOUS SOLUTIONS AT HIGH TEMPERATURES, by J. M. Baker and S. E. Bolt. Rept. on Contract W-7405-eng-26 [1961] 12p.

ORNL-3065 $0.50

Oak Ridge National Lab., Tenn.
ZIRCEX AND MODIFIED ZIRFLEX PROCESSES FOR DISSOLUTION OF 8% U-91% Zr-1% H TRIGA REACTOR FUEL, by T. A. Gens. Rept. on Contract W-7405-eng-26. [1961] 23p. 22 refs.

IDO-14321 $8.60

Phillips Petroleum Co., Idaho Falls.
THE NITRIC ACID DISSOLUTION OF URANIUM-ALUMINUM ALLOY IN A FLOODED CONTINUOUS DISSOLVER, by A. F. Boeglin, J. A. Buckham and others. Rept. on Contract AT(10-1)-205. Declassified 3 Feb 61. 96p. 11 refs.

TID-14229 $7.60

Purdue U., Lafayette, Ind.
SUSPENSION OF SOLIDS BY MIXING IMPELLERS. Progress rept. on Contract AT(11-1)-804. Oct 61, 77p. 10 refs.

Electrical and Electronic Engineering

PB 157 539 $2.60

Aeronutronic, Newport Beach, Calif.
A MAGNETIC INTEGRATOR FOR THE PERCEPTRON PROGRAM, by J. K. Hawkins and C. J. Munsey. Quarterly progress rept. 1 July-30 Sep 60, on Contract Nonr-2913(00). 21 Nov 60, 30p. 1 ref. Pub. no. U-1068; AD-246 848.

DESCRIPTORS: *Learning, Simulation, Electrical networks, Circuits, *Integrators, *Electronic equipment, *Slide projectors, *Photoelectric transducers, Amplifiers, *Discriminators, Test equipment, Design, Test sets, Operation, Tests, Perception.

Effort was devoted primarily to the system and circuit design of a medium-scale learning network simulator employing magnetic integrator components. System operation and the functions of major elements are described, and component and circuit designs are presented. A moderate experimental program on the single-neutron learning machine developed for testing magnetic integrators is also described. The system input is an automatic-advance optical slide projector, which will display the image on a 16 x 16 photocell raster. Provision is made for inserting up to approximately 500 integrators (W-units) and 60 neurons (A-units), although the full complement is not planned for early simulations. Output is by means of indicator lights. Provision is made for interconnecting A-units in a single-layer, multi-layer or complete cross-coupled (feedback) arrangements. Control on W-unit value growth is changed and made more flexible than in the one-element test unit, and permits sequential incrementing of integrator banks. A moderate number of fixed linear logic elements which may be interconnected to perform operations appropriate to particular environmental patterns are included. Experimental results given, include the successful learning of representatives of all classes of linearly separable Boolean functions of five input variables on the existing single-element test machine. (Author)

PB 156 226 $4.60

Bell Telephone Labs., Inc., Whippany, N. J.
MICROWAVE SOLID-STATE DEVICES. Interim rept. no. 2, 1 July-30 Sep 60, on Contract DA 36-039-sc-85325. 30 Nov 60, 44p. 8 refs. AD-251 218.

DESCRIPTORS: *Diodes, *Semiconductors, Silicon, Contamination Impurities, Design, *Microwave equipment, Crystals, Resistance, Tests, Gallium, Arsenides, Germanium.

The low-level performance of the PIN protective limiter has been substantially improved by low temperature alloy processing. Further improvement should be possible by reducing series resistance components. Expected improvement in high-level

performance is masked by what is believed to be poor injection at the P + - Pi contact, a problem which probably can be eliminated by proper doping of the alloy region. The theory of the surface varactor is in reasonable agreement with experimental results. Capacitance ratio and cut-off frequency approach, but are less than, those achievable with a comparable junction varactor at high cut-off frequencies. The surface varactor has, however, the virtues of structural simplicity, and probably can be fabricated without the severest ohmic contact requirements. Therefore, use of surface varactors at high frequency may be indicated if technological problems in construction of low capacitance, high cut-off junction varactors impose limitations on their performance. At medium frequencies, performance of the surface varactor is roughly equivalent to that of the junction varactor. At lower frequencies, however, the surface varactor appears to be superior. (Author)

PB 159 459 $3.60

Electronic Defense Labs., Mountain View, Calif.
VARIABLE STORAGE TIME DISPLAY UNIT, by M. Heslop. Rept. on Contract DA 36-039-sc-78281. 12 Aug 60, 36p. Technical memo. no. EDL-M295; AD-242 553.

DESCRIPTORS: Display systems, *Storage tubes, Cathode ray tubes, Design; Data storage systems, Signal to noise ratio, *Timing circuits, Operation, Theory

The development of a visual storage display unit with a controlled and gradual fading of stored data is discussed. This design makes use of the Hughes Tonotron storage tube. Variable storage times up to 5 minutes were obtained with gradual fading of all information. (Author)

PB 159 455 $15.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
THE TYPE H GYRO, COMPUTING AND ACCELEROMETER UNITS, by Howard R. Whitman, R. Langdon Wales, and James P. Anderson. Rept. on Contract W 33-038-ac-13969. Sep 53, declassified 6 May 57. 234p. 16 refs. Rept. R-17; AD-23 012.

DESCRIPTORS: *Gyroscopes, Design, Tests, Theory, Torque, Friction, Flotation, Velocity, *Accelerometers, *Computers, Mathematical computer data, Electrical equipment

This report includes the description, theory, and performance of the Type H single-degree-of-freedom torque-summation instruments developed for direct and integral indication of angular velocity, linear acceleration, and sums and products of electrical inputs. Flotation of the moving element results in low bearing friction and immunity from large accelerations. Comparison of open-and closed-chain performance indicates superiority of the closed-chain use for most applications. The range of choice of design parameters is indicated. (Author)

PB 181 092 $1.75

Lansdale Tube Co., Pa.
DIFFUSED-BASE R. F. POWER OSCILLATOR JUNCTION TRANSISTORS, by J. A. Hastings. Final rept. for 20 June 58-31 July 59 on Contract DA 36-039-sc-78051. [1959] 64p. Philco no. R220.1; AD-229 505.

DESCRIPTORS: Radiofrequency, *Transistors, *Transistor amplifiers, Amplifiers, *Oscillators, Very high frequency, Circuits, Design.

The successful development is presented of a 70 mc, one watt amplifier transistor. This device (the L-5437) has a minimum power gain of 5 db (grounded emitter) with an efficiency >65% at 70 mc, using 1 w RF output. Under these conditions, it is capable of continuously dissipating over 500 mW of power. Under overload conditions, continuous operation at 2.5 w dissipation for over 50 hr was achieved. A much greater level of power dissipation was achieved by mounting the transistor collector directly on a silver pedestal heat sink in a fashion analogous to that used for LF power transistors. A further improvement in the reliability and upper operating temperature limit was the use of cadmium electrodes and cadmium alloy solders. Extensive storage and operating life and environmental test data illustrate the potential increase in the power handling capability of this device. The results of the continuous operating life tests at 500, 600, and 700 mw dissipation; the 100°C storage life data; and the environmental test results, including the 20,000 G centrifuge, are included. (Author)

PB 156 628 $12.50

Okonite Co., Passaic, N. J.
HIGH POWER, NOISE FREE PULSE CABLE, by Robert G. Feller. Final rept. on Contract DA 36-039-sc-42669. [1955] 177p. AD-77 652.

DESCRIPTORS: *Pulse cables, Radiofrequency cables, Design, High frequency, Frequency, Voltage, Impedance, Mechanical properties, Electrical properties, Shielding, Electric insulation, Insulating materials, Butyl rubber, Silicon, Rubber, Dielectrics, Dielectric properties

Four new types of high voltage pulse cables have been designed taking into consideration the extremes of temperature to which they may be subjected, and their ability to withstand a considerable amount of flexing. A complete series of tests have been made to evaluate the electrical and mechanical properties of the cables, which includes high voltage breakdown and corona tests, power rating and efficiency of operation when carrying high power pulses having durations of .1 microsecond or greater. In general it has been shown that a triaxial cable construction (in which the outer and inner braids are separated by an insulated layer) is to be preferred to a coaxial construction.

PB 156 539 $8.10

Radio Corp. of America, Camden, N. J.
REDUCED MAXIMUM RESISTANCE FOR WIRE MOUNTED AT-CUT CRYSTALS, TASK NO. 403; REDUCED MAXIMUM VALUES AND NEW MINIMUM VALUES FOR RESONANCE RESISTANCE OF CRYSTAL UNITS OTHER THAN AT-CUT, TASK NO. 404, by R. R. Bigler. Final rept. 16 June 58-31 July 59, on Standardization Studies, Electronic Component Parts and Materials, Contract DA 36-039-sc-66470. [1959] 86p.

DESCRIPTORS: *Quartz crystals, Crystals, *Crystal units, Resonance, Resistance, Determination, Tests, Temperature, Frequency, Standards

An evaluation of the maximum resonance resistance values of 1480 AT-Cut crystal units was made over the operating temperature range of each unit. Special test equipment was developed to permit the data to be measured on an expanded scale for the accurate determination of maximum resistance over the operating temperature range. Chart recordings were made of these measurements and summarized in tabular and graphical form. An evaluation of the maximum and minimum resonance resistance values of 785 crystal units (other than AT-Cut) was made over the operating temperature range. Special test equipment was developed to permit the data to be measured on an expanded scale for the accurate determination of resonance resistance over the operating temperature range. Chart recordings were made of these measurements and summarized in tabular and graphical form.

AD-266 669 repriced $3.00

Sylvania Electronic Systems, Waltham, Mass.
MICROMINIATURIZATION TECHNIQUES FOR COMMUNICATION EQUIPMENT, by George Anderson. Rept. Mar 59-June 61, on Applied Communication Research for Air Force Vehicles, Contract AF 33(616)6309. Sep 61, 153p. Rept. no. F440-3; ASD Technical rept. 61-453.

DESCRIPTORS: *Communication equipment, Airborne, *Subminiature electronic equipment, Electronic equipment, Design, Reliability, Thin films, Resistors, Ceramic capacitors, Tantalum capacitors, Capicators, Printed circuits, Coils, Transistors, Diodes, Semiconductors, Circuits, Broadband, Amplifiers, Intermediate frequency amplifiers

Aerospace electronic equipment must be capable of high performance reliability coupled with small size and low weight. This report is a summary of data gathered and experience gained while microminiaturizing major portions of an ultrareliable uhf communications receiver. The report compiles information and instructions to guide transistor circuit engineers in designing semiconductor circuits that lend themselves to microminiaturization. Throughout the report, examples are cited and design approaches are delineated which resulted from work performed under this contract. As a demonstration of microminiaturization capabilities, a wide band video amplifier, receiver redundant 60-mc i-f circuits, automatic gain control circuits, and uhf power amplifier and double circuits were built, tested and delivered. (Author)

PB 158 568 $8.10

General Dynamics/Convair, San Diego, Calif.
STUDY OF THE HUMAN ELEMENT IN THE FUTURE ANTI-BALLISTIC MISSILE SYSTEMS. ANNOTATED BIBLIOGRAPHY, by E. N. Kemp and P. B. Hall. Rept. on Contract Nonr-2953(00). 31 Dec 60, 89p. 395 refs. ZG-018; ARPA Order 5-58, Task 9; AD-250 754.

DESCRIPTORS: *Early warning radar, Training, *Antiaircraft defense systems, *Tracking, *Data transmission systems, *Bibliography, *Data processing systems, *Display systems, *Operations research, *Human engineering, *Personnel, *Attention, Surface to surface, *Reasoning, Countermeasures, Selection, Manned, Physiology, Maintenance. Games theory, Guided missiles, Bibliography.

Contents:

Human factors: Bionics; Communications and information; Decision making; Human engineering; Maintenance; Methods and models; Monitoring and vigilance; Operators and performance; Personnel - manning, selection and training; Physiological; Tracking; General and systems

Systems and systems concepts: Defense systems; Offense systems; Reconnaissance and warning systems

AD-263 567 $2.60 Not announced by ASTIA

Human Engineering Labs., Aberdeen Proving Ground, Md.
AN INVESTIGATION OF PORTABILITY PRINCIPLES FOR TWO-MAN LOADS AS APPLIED TO T201 MORTAR, by Lucius V. Clark, James P. Torre, and Robert T. Gschwind. Sep 61, 26p. 1 ref. Technical memo. 16-61.

DESCRIPTORS: *Mortars, Gun mounts, Military personnel, Load distribution, *Handling, *Human engineering, Tests, Transportation, Stretchers, Packs, Ordnance.

A study was conducted to investigate the effects of human engineering principles upon the portability of two-man loads ranging from 100 to 170 pounds in weight. Components of a T201 Mortar were equipped with portability kits in the form of detachable stretcher and satchel-type handles. The components were transported for about 1/2 a mile over varying types of terrain. Distance, rate of carry, plus time and frequency of rest were used as measures of portability. It was found that stretcher-type handles made a significant improvement in portability and that by using these handles and relieving the strain upon the porters' hands, optimum portability can be achieved. It is recommended that portability be considered in the development of heavy infantry weapons as efficient tactical usage may be dependent upon portability. (Author)

AD-262 476 $3.60 Not announced by ASTIA
Human Engineering Labs., Aberdeen Proving Ground, Md.
MUZZLE BLAST MEASUREMENTS ON HOWITZER, 155 mm, M1A2E3 WITH MUZZLE BRAKE NO. 8, by Howard H. Holland, Jr. July 61, 39p. 12 refs. Technical memo. 14-61.

DESCRIPTORS: *Howitzers, *Gun barrel attachments, Blast, Measurement, Human engineering, *Military personnel, *Ear, Injuries, Ear protectors.

Measurements of muzzle blast in the crew area of the 155 mm Howitzer, M1A2E3, with Muzzle Brake No. 8, were made primarily to determine the peak over pressures produced. Measures of positive impulse and duration of positive phase were also made. The howitzer was fired at elevations of 0, 32.5, and 65 degrees with 70°F and 125°F propelling charges. Some of the overpressures measured were high enough to cause inner-ear deafness and to rupture unprotected human eardrums. It is recommended that the wearing of the V-51R earplug be mandatory for all personnel located in the crew area when the 155mm Howitzer, M1A2E3, is being fired. (Author)

PB 159 463 $13.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
TRAJECTORY STUDIES, VOLUME I, by Philip A. Lapp. Doctoral thesis, Rept. on Contract AF 33(616)2392. Dec 54, declassified 15 July 59, 192p. 22 refs. Rept. T-63; DIC Proj. 7243; AD-66 102.

DESCRIPTORS: Theses, *Guided missile trajectories, Geophysics, Aerodynamics, Thrust, Perturbation theory, Series, Differential equations, *Rocket trajectories.

The trajectories of long-range ballistic missiles are treated in detail. Emphasis is placed on inter-continental ranges in the order of 4000 to 6000 nautical miles. A criterion is developed for executing a powered-flight trajectory that will achieve some final desired velocity vector with minimum fuel. It is shown that this optimal trajectory can never be attained in practice due to limitations imposed by the structural design of the missile. The free-flight trajectory that results after the termination of thrust is analyzed in detail.

MND-P-2291 $4.60

Martin Co., Baltimore, Md.
AERODYNAMIC RE-ENTRY ANALYSIS, TASK 2, THERMOELECTRIC GENERATOR. Summary rept. Declassified 18 Sep 61. 36p.

PB 159 461 $7.60

Research Inst., Temple U., Philadelphia, Pa.
FUNDAMENTAL STUDIES OF NEW EXPLOSIVE REACTIONS, by A. D. Kirshenbaum. Final rept. on Contract DA 36-034-ORD-1489. 30 Apr 56, 71p. 33 refs. AROD rept. no. 916:1

DESCRIPTORS: *Explosives, Explosive gases, Liquefied gases, Solidified gases, Methane, Oxygen, Carbon compounds, Monoxides, Cyanogen, Hydrogen, Metal powders, Powders, Oxidizers, Gases, Chemical reactions, Heat of reaction, Detonation, Shock waves, Sensitivity.

The purpose of the project was to study explosive systems (1) composed of liquefied or solidified gases, such as (a) liquid methane and liquid oxygen; (b) liquid carbon monoxide and liquid oxygen; (c) solid cyanogen and liquid oxygen; (d) liquid hydrogen and solid oxygen; (2) leading to refractory explosion products, such as (a) powdered aluminum and liquid oxygen; (b) powdered magnesium and liquid oxygen and (3) composed of premixed gaseous hydrogen and gaseous fluorine.

NAA-SR-6303 $9.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
ORBITAL FORCE FIELD BOILING AND CONDENSING EXPERIMENT. Topical rept. no. 11 on SNAP II Power Conversion System, Contract AT(11-1)-GEN-8. 110p. TRW ER-4443.

Ship Building

PB 181 102 $1.75

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
HYDRODYNAMICS OF HIGH SPEED SHIPS, by Paul R. Van Mater, Jr., Robert B. Zubaly, and Petros M. Beys. Rept. on Contract MA 1809, Task 1. Oct 61, 64p. 4 refs. Rept. no. 876.

DESCRIPTORS: *Merchant vessels, Velocity, *Hydrodynamics, Model tests, Ship hulls, Design, Ships.

This report describes the development of a hull form, the experimental determination of trends of smooth water resistance, and the results of model tests in irregular long crested seas of a series of surface merchant ships in the speed range of 30 to 50 knots with displacements of 20,000 to 80,000 tons.

PB 181 101 $1.25

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
SURVEY OF FUEL CELL DEVELOPMENT WITH EMPHASIS ON MARITIME APPLICATIONS, by S. C. Y. Chen and Wilbur Marks. Rept. on Contract MA-1809, T.O. 7, Sep 61, 50p. 50 refs. Rept. no. 868.

DESCRIPTORS: *Merchant vessels, Propulsion, *Fuel cells, Design, Operation, Effectiveness, Economics, Technological intelligence.

A survey is made of the state-of-the-art of fuel cell development with the object of determining the potential of this device for commercial ship propulsion. General principles of fuel cell reactions are expounded and reasons are given for theoretically superior efficiencies of fuel cells over conventional heat engines. Operating characteristics of various fuel cells and current development activities are reviewed. Technical factors bearing on use of fuel cells for ship propulsion are examined and problem areas in research are outlined. Conclusions reached maintain that while the economics of fuel cells for ship propulsion cannot

yet be fully determined, apparent operational advantages exist to warrant further development efforts. A number of recommendations for support in fuel cell research and development are presented.

PB 181 104 $2.00

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
SURVEY OF PROPULSIVE DEVICES FOR MERCHANT MARINE APPLICATION. Rept. on Contract MA-1809, T.O. 7. Oct 61, 74p. 87 refs. Rept. 874.

DESCRIPTORS: *Merchant vessels, *Propulsion, *Marine propellers, Cavitation, Ventilation, Design, Tests, Technological intelligence, Hydrodynamics

This report includes:
Future trends in marine propulsion systems, by Robert Taggart, Inc., Rept. no. RT-4901
On the range of applicability of supercavitating and ventilated propellers, by Hydronautics, Inc., Technical rept. 134-1

An analysis is presented of the performance of conventional single and twin screws, contra-rotating propellers, noncavitating propellers in nozzles, and vertical axis propellers. An analysis is made of the influences of design parameters, principally thrust loading and blade strength, on the expected performance of supercavitating propellers.

PB 181 103 $1.50

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
SURVEY ON THE POTENTIAL OF GROUND EFFECT MACHINES IN MARITIME TRANSPORT, by S. C. Y. Chen and Wilbur Marks. Rept. on Contract MA-1809, T/O 7. Oct 61, 56p. 144 refs. Rept. no. 871.

DESCRIPTORS: *Merchant vessels, *Ground effect, Machines, Technological intelligence, Design, Operation, Motion, Stability, Control, Hydrodynamics, Propulsion, Power, Economics.

A review is made of the completed and currently active research and development efforts in the United States and abroad on the subject of ground effect machines (GEM). Both the technical and economic developments are studied and conclusions and recommendations are made relating to possible application of GEM in the merchant marine field.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 157 520 $4.60

General Electric Co., Schenectady, N. Y.
GAS-LUBRICATED CYLINDRICAL JOURNAL BEARINGS OF FINITE LENGTH. PART II. DYNAMIC LOADING, by B. Sternlicht. Technical rept. on Contract Nonr-2844(00). 9 Sep 60, 47p. 5 refs; AD-245 535.

DESCRIPTORS: *Gas bearings, *Journal bearings, Load distribution, Gases, Lubricants, Reynolds number, Mathematical analysis, Lubrication, Dynamics.

This paper presents numerical solutions of the quasi-steady state, Reynolds equation for finite length, gas-lubricated, cylindrical journal bearings under dynamic loading. (Dynamic loading is considered to exist where the journal center rotates and translates, which implies that the load changes in magnitude, direction, or both.) Employing stationary and rotating coordinate systems, correspondence relations are established for the derivatives of force with respect to displacement and velocity using first-order perturbation solutions. Comparison of the iterative and first-order perturbation solutions are made. The results are presented in dimensionless form which can be readily used by design engineers for dynamic analyses of such phenomena as critical speed, synchronous whirl, half-frequency whirl, etc. (Author)

TID-14358 $1.58

Messinger Bearings, Inc., Philadelphia, Pa.
DRY RUNNING TWO 440-C HEAT-TREATED STAINLESS STEEL ANNULAR BALL BEARINGS IN A HELIUM ATMOSPHERE AT 510°F TEMPERATURE. Rept. on subcontract S-770-1028-2-3-1 to Baldwin-Lima-Hamilton Corp. Sep 61, 47p.

TID-14359 $4.60

Messinger Bearings, Inc., Philadelphia, Pa.
DRY RUNNING TWO 440-C HEAT TREATED STAINLESS STEEL ANNULAR BALL BEARINGS IN A HELIUM ATMOSPHERE AT 510°F TEMPERATURE. Rept. on subcontract S-770-1028-2-3-A to Baldwin-Lima-Hamilton Corp. Oct 61, 44p.

PB 159 232-2 $9.60

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
EVALUATION OF BEARINGS AND SEALS IN 90% HYDROGEN PEROXIDE, by H. O. Pederson, S. R. Matos, and J. Hyll. Rept. for 1 June 58-28 Feb 59 on Contract NOas 56-506-c. Rept. RMD 103F, Vol. II; AD-225 213.

DESCRIPTORS: *Bearings, Journal bearings, Roller bearings, *Seals, Tests, *Hydrogen compounds, *Peroxides, Chemical reactions, Rocket motors, Centrifugal pumps

The results show that it is feasible to run a bearing submerged in room temperature 90% hydrogen peroxide, and submerged in 90% hydrogen peroxide when decomposition of hydrogen peroxide is taking place in a large capacity catalyst bed located adjacent to the bearing housing. A sleeve bearing consisting of a compatible material such as teflon with glass as an additive will give better performance than a stainless steel roller or needle bearing which tend to contaminate the peroxide. Face seals and segmented shaft seals which have the stationary sealing elements made of teflon with glass as an additive will perform well in peroxide at room temperature, but not as well under high temperature conditions produced by peroxide decomposition in the catalyst bed. The teflon elements disintegrate quickly under the high temperature environment, particularly on the segmented shaft seals. An S-Monel France type shaft seal will perform well in combination with a Ni-resist sleeve under the high temperature

conditions. However, the leakage rate is high because this is a "controlled gap" type seal. Test results indicate that the best sealing arrangement for the high temperature conditions is one which uses a positive seal (either a face or shaft type with a teflon-glass stationary sealing element, which is shielded from the high temperature gases by a series of all metal "controlled gap" seals. (Author)

Manufacturing Equipment and Processes

PB 158 580 $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THE AOQL MULTI-LEVEL CONTINUOUS SAMPLING PLANS, by G. Elfving. Technical rept. no. 48 on Contract Nonr-225(53). 5 Dec 60, 25p: 5 refs. AD-250 263.

DESCRIPTORS: *Sampling, *Quality control, Statistical analysis, Probability.

The multi-level plans (MLP) for continuous quality control are considered. The discussion aims to find the payoff level (AOQL) for processes not in control. Only probability sampling, at a finite number of levels characterized by decreasing but otherwise arbitrary, sampling rates, and arbitrary relaxation numbers are considered. Under a certain restriction on Nature's strategies, the AOQL is derived for the procedures MLP - 1, MLP - T, and MLP - r. The results are given in a theorem. Nature's optimal strategy is shown to be always deterministic, and to lead to a process in which the sampling levels follow each other cyclically in a completely determined way. (Author)

PB 157 485 $1.60

Battelle Memorial Inst., Columbus, Ohio.
A COMPUTATION RULE FOR STANDARD DEVIATIONS OF RELIABILITIES OF SERIES-PARALLEL CONFIGURATIONS, by Ralph E. Thomas. Technical rept. no. 3 on Contract Nonr-2864(00). Oct 60, 20p. 2 refs; AD-245 659.

DESCRIPTORS: Reliability, *Quality control, Mathematical analysis, Statistical analysis, *Probability, Matrix algebra, Electrical networks.

A computation rule is derived for the standard deviation. Sums of products arise in estimating reliabilities of series-parallel circuits or of systems which can be represented by equivalent circuits. The assumption is made that each true value is estimated. Each estimate has an estimated standard deviation. These estimators are also assumed to be statistically independent. Proof is given that, in the development of the computation rule, the reliability of an equivalent circuit can always be expressed as a sum of products. The products involve only first powers of every component probability which occurs. The coefficients of the products take discrete values -1, 0, or 1, and the sum of the coefficients is unity. The validity of the rule is based on direct examination of a derived mathematical expression for the standard deviation of a sum of products. This expression, in turn, is based on the exact expression for the standard deviation of a product given in PB 157 484. (Author)

PB 157 484 $1.60

Battelle Memorial Inst., Columbus, Ohio.
AN IMPROVED FORMULA FOR THE STANDARD DEVIATION OF THE RELIABILITY PRODUCT RULE, by Ralph E. Thomas. Technical rept. no. 2 on Contract Nonr-2864(00). Oct 60, 14p. 6 refs; AD-245 658.

DESCRIPTORS: Reliability, *Quality control, Mathematical analysis, Statistical analysis, *Probability, Series, Taylor's series, Factor analysis.

An improved formula for the standard deviation of the reliability product rule P is derived. The assumption is made that each true value is estimated. Each estimate has an estimated standard deviation. In addition, the estimators are assumed to be statistically independent. The result is proved by induction and represents a straightforward generalization of certain specialized results which have appeared in the literature. By means of a numerical example, the result is favorably compared with current estimation methods based on root-mean-squares and on Taylor's series expansions. Based on these results, the recommendation is made that future computations of the standard deviation of the reliability product be based on the exact expression. (Author)

PB 157 486 $2.60

Battelle Memorial Inst., Columbus, Ohio.
RELIABILITY SCREENING OF ELECTRONIC COMPONENT PARTS, by Ralph E. Thomas. Technical rept. no. 4 on Contract Nonr-2864(00). Oct 60, 26p. 5 refs. AD-252 147.

DESCRIPTORS: *Electronic equipment, *Transistors, Reliability, Determination, *Quality control, Life expectancy, Measurement, Test methods.

A numerical example of the construction of a reliability screening criterion is given for a set of 120 NPN small-signal transistors operated at 100 C at full power dissipation for approximately 1000 hours. The calculations are based on linear discriminant analysis. Two parameters were found to be good predictors of the future quality of the transistors. A parametric criterion of failure was defined at 1000 hours which divided the transistors into 60 failures and 60 nonfailures. Based on measurements available after 100 hours of operation the reliability screening criterion correctly predicted the quality of 109 transistors (91%) at 1000 hours of operation. Only 3 of the 60 failures (5%) at 1000 hours were not predicted by the screening criterion. The corresponding expected values of these probabilities of correct prediction were calculated and were found to be 87 and 13%. The results suggest that the reliability screening criterion may be a useful technique for improving the reliability of electronic component parts. (Author)

PB 159 298 $2.60

Sibley School of Mechanical Engineering, Cornell U., Ithaca, N. Y.
AN ADAPTATION OF THE MIL-STD-105B PLANS TO RELIABILITY AND LIFE TESTING APPLICATIONS, by Henry P. Goode and John H. K. Kao. Technical rept. no. 3 on Contract Nonr-401(43). Jan 61, 23p. 3 refs. AD-250 282.

DESCRIPTORS: Test methods, Reliability, *Quality control, *Sampling, Statistical analysis, *Statistical processes, Standards, Statistical distributions.

A procedure is presented, with tables of necessary conversion ratios, for applying the MIL-STD-105B sampling-inspection plans to reliability and life-testing applications. The method assumes the Weibull distribution (including the exponential distribution) as a statistical model for item lifelength. Inspection of sample items is by attributes with life testing truncated at the end of some specified time, t. Lot quality is evaluated in terms of mean item life, u. Both t and u are measured from some reference time. (Author)

MATERIALS

PB 181 110 $3.50

Harvey Aluminum, Inc., Torrance, Calif.
DEVELOPMENT OF OPTIMUM METHODS FOR THE PRIMARY WORKING OF REFRACTORY METALS, by R. W. Tombaugh, R. C. Green, and J. H. Gehrke. Rept. for Apr 60-May 61 on Metallic Materials, Contract AF 33(616)6377. Aug 61, 235p. 17 refs. WADD Technical rept. 60-418, Part II.

DESCRIPTORS: *Refractory materials, Alloys, Processing, *Extrusion, Chromium alloys, Niobium alloys, Iron alloys, Molybdenum, Molybdenum alloys, Nickel alloys, Tantalum alloys, Titanium, Titanium alloys, Forging, Lubrication, Dies, Design, Crystallization, Hardness, Microstructure, Mechanical properties, Rolling mills, Metallurgy, Metals

The process developed during the first years' work has been considerably improved and has been used successfully in extruding refractory metals at temperatures above 4000°F. This has required the development of improved high temperature billet lubrication, novel die designs utilizing ceramic facing materials, high temperature heating facilities and methods for accurately sensing billet temperatures. The suitability of the process has been established by metallurgical evaluation of extruded materials which have demonstrated a high degree of amenability to subsequent reworking by conventional methods. In addition, the extrusion process as developed has been applied to a wide variety of refractory metal alloys and has been useful in providing a substantial quantity of wrought materials for other contractors and governmental agencies. (Author)

ORO-461 $2.25

Southern Research Inst., Birmingham, Ala.
THE TRUE STRESS-STRAIN PROPERTIES OF BRITTLE MATERIALS TO 5000°F. Final rept. on Contract 5081-1190-XIV. July 61, 99p.

Rubber and Elastomers

PB 181 093 $4.00

Quartermaster Research and Engineering Command, Natick, Mass.
PROCEEDINGS, JOINT ARMY-NAVY-AIR FORCE CONFERENCE [NO. 6] ON ELASTOMER RESEARCH AND DEVELOPMENT. BOSTON, MASSACHUSETTS, 18-20 OCTOBER 1960. VOLUME 1, ed. by J. C. Montermoso and F. R. Fisher. [1960] 273p. 170 refs. AD-250 915.

DESCRIPTORS: *Elastomers, *Polymers, Chemical properties, Industrial research, High temperature research, Conferences, Physical properties, Mechanical properties, Low temperature research, Synthesis, Military research, Symposia.

Papers were presented which covered basic polymer research and special applications of elastomers, and new elastomers. Some United Kingdom developments in elastomers and highlights of European polymer research were outlined. During the session on basic polymer research, papers were given on mechanical and structural properties, chain entanglements and dimensions, zone refining fractionation, cross-linking, and synthesis of various polymers. High- and low-temperature properties were also discussed. Volume 2(AD-250 916) contains papers on various applications of polymers such as sealants, damping materials, radiation-resistant materials, and materials for various military applications. New elastomers that were considered are silicon, fluorine, and nitroso compounds.

PB 181 094 $6.00

Quartermaster Research and Engineering Command, Natick, Mass.
PROCEEDINGS, JOINT ARMY-NAVY-AIR FORCE CONFERENCE [NO. 6] ON ELASTOMER RESEARCH AND DEVELOPMENT. BOSTON, MASSACHUSETTS, 18-20 OCTOBER 1960. VOLUME 2, ed by J. C. Montermoso and F. R. Fisher, [1960] 426p. 113 refs. AD-250 916.

DESCRIPTORS: *Elastomers, *Polymers, Low temperature research, Military research, Conferences, Synthesis, Chemical properties, High temperature research, Industrial research, Physical properties, Mechanical properties.

See also PB 181 093

AD-267 999 $0.75

Rock Island Arsenal Lab., Ill.
ADDITIVES FOR IMPROVING HEAT STABILITY OF SILICONE VULCANIZATES, by E. W. Bergstrom. 26 Sep 61, 25p. 5 refs. Rept. no. 61-3505.

DESCRIPTORS: *Silicones, *Vulcanizates, Aging, Stability, Heat tolerance, Chemical, *Additives, Carbon black, Cerium compounds, Chromium compounds, Nickel compounds, *Rubber, Zirconium compounds, Iron compounds, Oxides, Phosphates, Manganese compounds, Dioxides, Effectiveness

Numerous chemical additives were evaluated in a silicone rubber vulcanizate in efforts to improve the heat stability of the vulcanizate, (1) when aged at 600° and 700°F, and (2) when tested at 300° and 500°F. Those additives which improved the heat stability of the vulcanizate when aged at 600°F were a FT carbon black, cerium oxide, chromium oxide, ferric oxide, ferric phosphate (insoluble), manganese dioxide, nickel oxide and zirconium oxide. The ferric compounds and the FT carbon black also improved the heat aging stability at 700°F. Shrinkage (volume loss) was very noticeable on all silicone vulcanizates which had been aged at 600° and 700°F. None of the additives improved the retention of physical properties of the vulcanizate when tested at 300° or 500°F. (Author)

MATHEMATICS

PB 159 416 $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
GAMES ON THE UNIT-SQUARE WITH DISCRETE PAYOFF, by Marcel Neuts. Technical rept. no. 26 on Contract Nonr-225(28). 27 Feb 61, 50p. 4 refs. AD-253 011.

DESCRIPTORS: *Games theory, Matrix algebra, Theory.

A few examples that were previously discussed in the literature are imbed in a fairly large class of games with a discrete payoff. After a precise definition, the results obtained are summarized. A wider class of games is defined for which a general method of solution is described. The value and the optimal strategies for both players are determined. With a suitable prescription of the game-kernel on the lines of discontinuity, the game admits a pair of optimal strategies, which are mixtures over n+2 pure strategies. In all but a single case, both players possess infinite sets of minimax strategies. A natural problem which arises is concerned with the characterization of admissible minimax strategies. For each player a class of admissible optimal strategies exists and such strategies are exhibited explicitly. How far the difinition of the payoff on the lines of discontinuity can be relaxed without affecting the optimality properties of the strategies previously determined is discussed. The class of games is extended such as to allow one more value for the payoff function. A general method to obtain at least one pair of optimal strategies is indicated and a few special cases are worked out. The connection of the class of games under study with a class of matrix-games is pointed out. (Author)

PB 159 372 $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
GEOMETRIC AND GAME-THEORETIC APPROACHES TO OPTIMUM ALLOCATION, by G. Elfving. Technical rept. no. 68 on Contract Nonr-225(52). 17 Feb 61, 16p. 3 refs. AD-254 802.

DESCRIPTORS: Design, Theory, *Games theory, Geometry, *Applied mathematics.

PB 159 371 $6.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A MATHEMATICAL THEORY OF GUARANTEE POLICIES, by Lloyd F. Bell. Technical rept. no. 49 on Contract Nonr-225(53). 24 Feb 61, 63p. 6 refs. AD-253 586.

DESCRIPTORS: Supplies, Probability, *Costs, Mathematical analysis, Theory

Guarantee policies are considered in which the length of the guarantee is significantly connected with the expected life of the item guaranteed. A generalized policy of this type is as follows: If an item that is guaranteed for a period of time of length x fails at time T less than x after the beginning of the period, it is replaced and the guarantee is renewed with the customer being charged the fraction $kT/x, k => 0$, less than 1, of the sales price of the item. The particular cases $k = 0$ and $k = 1$ correspond to guarantee policies in common use. Under the $k = 0$ policy, if an item that is quaranteed for a period of time of length x fails at time T less than x, the item is replaced and the guarantee is renewed without the customer being charged. Under the $k = 1$ policy, the item is replaced and the guarantee renewed, as above; however the customer is charged the fraction T/x of the price of the item. It is assumed that the demand function $D(k, x)$, is non-negative, is a non-increasing function of k and is a non-decreasing function of x. Criteria for the selection of the values of k and x that maximize expected profit are required; these involve the production cost, sales price, distribution of time of failures, and the demand function. (Author)

PB 159 289 $1.60

Columbia U. [New York].
SOME CONTRIBUTIONS TO THE THEORY OF CASCADES, by Peter E. Ney. Doctoral thesis. Rept. on Contracts Nonr-266(33) and Nonr-401(03). [1960] 11p. CU-47-60-Nonr-266(33); AD-251 000.

DESCRIPTORS: Particles, Scattering, *Statistical analysis, Statistical functions, Statistical distributions, *Probability.

PB 159 417 $1.60

Columbia U., New York.
TORSION FREE AND PROJECTIVE MODULES, by Hyman Bass. Rept. on Contract Nonr-266(57). [1960] 17p. 9 refs. CU-7-60-ONR-266(57)-M; AD-251 807.

DESCRIPTORS: *Algebras, Rings, Functions.

Seshadri (Proc. Nat. Acad. Sci. 44, 456, 1958) has proved that $n = 2$, projective modules over the polynomial ring K (x sub 1, . . . , X sub n), K a field, are free. By modifying Seshari's argument it is shown that R may be any Dedekind ring. An example is provided which shows that some assumption like integral closure on R is, in general, necessary for this conclusion. (Author)

PB 181 100 $0.75

Geological Survey [Washington, D. C.].
TABLE OF COMMON LOGARITHMS AND THEIR SQUARES, by Josephine G. Boerngen. Dec 61, 22p. 6 refs.

DESCRIPTORS: *Logarithms, Tables

The table gives all whole numbers from 1 to 1,000 and by one hundreds from 1,000 to 10,000; the 5-place logarithms of the numbers taken from War Department Technical Manual 5-236, table 1 (1940, p. 8-27); and the square of the logarithm of each number, computed to ten places but rounded off to five places. Truncation errors may be as much as 1 unit in the fifth digit.

HW-68858 $1.10

Hanford Atomic Products Operation, Richland, Wash.
A COMPUTER SOLUTION TO THE GENERALIZED LEAST SQUARES PROBLEM, by J. R. Lilley and E. L. Kelley. Rept. on Contract AT(45-1)-1350. Mar 61, 11p.

KAPL-M-GLB-6 $1.60

Knolls Atomic Power Lab., Schenectady, N. Y.
TOLERANCE LIMITS FOR SMALL LOTS WHEN SAMPLE PIECES ARE SOMETIMES MISCLASSIFIED, by G. L. Burrows. Rept. on Contract W-31-109-eng-52. Sep 61, 16p.

UCRL-6581 $4.60

Lawrence Radiation Lab., U. of California, Livermore.
MONTE CARLO METHODS. A BIBLIOGRAPHY COVERING THE PERIOD 1947-JUNE 1961, by Rose Kraft and Carl J. Wensrich. Rept. on Contract W-7405-eng-48. Sep 61, 50p. 500 refs.

PB 156 081 $3.60

North Carolina U., Chapel Hill.
NEARLY BEST LINEAR ESTIMATES, by Carl-Erik Sarndal. Interim technical rept. no. 4 on Estimation and Testing of Parameters on Distributions by Order Statistics, Grant no. DA-ORD-7. 25 Feb 61, 36p. 8 refs. OOR no. 2776:4; AD-253 055.

DESCRIPTORS: *Mathematical prediction, Distribution, Effectiveness, Corrections, Statistical analysis.

Blom's (Avkiv for Matematik, BD3, NR31, 365; and Statistical Estimates and Transformed Beta-Variables, Stockholm, 1958) concepts are used to derive several different types of linear estimates, all of which can be said to be nearly best. An examination is made of their efficiencies when applied to estimation of the scale parameter in the normal, exponential, Weibull, gamma and logarithmic-normal distributions. The so called alpha, beta-correction, suggested by Blom to get a good approximation of means of order statistics will be investigated numerically. Another correction factor delta, which will prove useful in approximation of variances of nearly best linear estimates is introduced and examined. There is an illustration of how alpha, beta and delta-corrections can be used to derive linear estimates, when the exact moments of order statistics are incompletely known. (Author)

PB 157 408 $4.60

Virginia Agricultural Experiment Station, Blacksburg, Va.
TABLES TO FACILITATE MULTIVARIATE SEQUENTIAL TESTING FOR MEANS, by Rudolf J. Freund and J. Edward Jackson. Technical rept. no. 12 on The Development of Statistical Methods for Experimental Designs in Quality Control and Surveillance Testing, Contract Nonr-2352(01). Sep 60, 42p. 11 refs. AD-246 995.

DESCRIPTORS: *Sequential analysis, *Statistical tests, Analysis of variance, Statistical functions, Tables, *Quality control, Statistical analysis, Sampling.

Computing Devices

ANL-6447 $1.00

Argonne National Lab., Ill.
GAMMA I. A GENERAL THEOREM-PROVING PROGRAM FOR THE IBM-704, by John Alan Robinson. Rept. on Contract W-31-109-eng-38. Nov 61, 46p.

UCRL-6255 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
NANOSECOND DATA ACQUISITION SYSTEM, by Marcus R. McCraven and Richard C. Epps. Rept. on Contract W-7405-eng-48. Sep 61, 32p.

ORNL-3235 $0.50

Oak Ridge National Lab., Tenn.
GETTING MULTICHANNEL ANALYZER DATA IN AND OUT OF THE IBM-7090 FOR PROCESSING, by C. D. Goodman. Rept. on Contract W-7405-eng-26. [1961] 11p.

MECHANICS

WAPD-TM-259 $0.75

Bettis Atomic Power Lab., Pittsburgh, Pa.
PRESSURE, THERMAL, AND VIBRATIONAL LOADS AND DEFLECTIONS IN LINEAR ELASTIC STRUCTURES—FORTRAN II PROGRAMS CTAC AND MODE, by C. M. Friedrich. Rept. on Contract AT(11-1)-GEN-14. Dec 61, 32p. 4 refs.

AD-265 640 $2.60 Not announced by ASTIA

Florida U. Engineering and Industrial Experiment Station, Gainesville.
RESPONSE OF AN ELASTIC PLATE TO A DISTRIBUTED RANDOM PRESSURE CHARACTERIZED BY A SEPARABLE CROSS CORRELATION, by William A. Nash. Technical note no. 1 on Contract AF 49(638)328. Sep 61, 30p. 19 refs. AFOSR-1215.

DESCRIPTORS: *Mechanics, *Elasticity, *Sheets, Surface properties, Density, Pressure, Shear stresses, Noise generators, Vibration, Damping, Power, Power meters, Harmonic analysis, Theory, Time, Statistical analysis, Statistical functions, Differential equations, Integral equations, Matrix algebra, Functions, Integral transforms, Integrals, Aircraft, Guided missiles, Gust loads, Wind tunnels, Turbulence.

The technique of generalized harmonic analysis is employed to predict the mean-square response of a thin elastic plate to a random pressure acting normal to the surface of the plate. Damping of the plate is considered, and it is assumed that the pressure is spatially uniform. A general expression is presented for the power spectrum of the response; and, for the special case of a space-time separable pressure cross correlation, the response is evaluated for two cases: (a) white noise, and (b) all noise power concentrated at one frequency. (Author)

HW-60611 $1.10

Hanford Atomic Products Operation, Richland, Wash.
STABILITY OF PRESSURIZED TUBES DURING PRIMARY CREEP, by K. R. Merckx. June 59, 3p.

UCRL-9922 $2.25

Lawrence Radiation Lab., U. of California, Berkeley
GEOMETRIC FOUNDATIONS OF CONTINUUM MECHANICS, by John A. Simmons. Rept. on Contract W-7405-eng-48. Oct 61, 99p. 20 refs.

SCR-408 $3.50

Sandia Corp., Albuquerque, N. Mex.
TABLES AND GRAPHS OF THE NORMALIZED RESPONSE OF TWO COUPLED MASS SPRING SYSTEMS WITH DAMPERS SUBJECTED TO A FREQUENCY SQUARED DRIVER, by George Reis. May 61, 251p.

PB 157 544 $8.60

Southwest Research Inst., San Antonio, Tex.
YIELD COLLAPSE OF STIFFENED CIRCULAR CYLINDRICAL SHELLS, by R. C. DeHart and N. L. Basdekas. Rept. on Contract Nonr-2650(00). Sep 60, 99p. 18 refs. AD-246 407.

DESCRIPTORS: Cylindrical bodies, Structural shells, Stiffened cylinders, *Stresses, Pressure, Materials, Metals, Elasticity, Plasticity, Buckling.

Information available as a result of the theoretical and experimental work clearly indicated that for the yield mode of collapse and for the shell thicknesses, the maximum strength-weight ratio is obtained when: (1) the stiffener spacing is such that the radical displacement in the shell at mid-bay is reduced over that prevailing in an unstiffened cylindrical shell; (2) for materials having a nonlinear stress-strain curve, i. e., no pronounced yield point, the stiffener spacing is close enough to prevent collapse from occurring until relatively large permanent strains are produced; and (3) some plastic or nonlinear strain is present in the stiffener at the time of collapse. The maximum amount of plastic or nonlinear strain that can be allowed cannot as yet be determined and is probably dependent to a large extent upon the number of bays or over-all length of the stiffened shell. Fortunately, some conservatism in stiffener design does not result in a large increase in over-all weight of the structure. (Author)

Aerodynamics and Pneumatics

AD-265 964 $3.60

Avco-Everett Research Lab., Mass.
CHEMICAL KINETICS OF HIGH TEMPERATURE AIR, by Kurt, L. Wray. Rept. on Contracts AF 04(647)278 and DA 19-020-ORD-5476. June 61, 31p. 35 refs. Research rept. 104; AFBSD-TR-61-32.

DESCRIPTORS: *Hypersonic flow, Shock waves, Gases, Plasma physics, Recombination reactions, Dissociation, Air, Molecules, Oxygen, Nitrogen, *Reaction kinetics, High temperature research

When a hypersonic object enters the earth's atmosphere, a shock wave is formed in front of it, and the air passing through this shock wave is heated to high temperatures. The shock heated molecules equilibrate their translational and rotational degrees of freedom within a distance of a few mean free paths. To achieve equilibrium, it is necessary to excite vibration, dissociate molecules, produce new molecules, and produce ions and electrons. The problem is complex since all these phenomena occur simultaneously and because the reaction rates depend on the temperature, density, and composition which are changing during the relaxation toward equilibrium. The experimental techniques used to investigate these reactions are briefly discussed along with the resulting rate expressions obtained by the various investigators. A compilation of the rate expressions for these reactions representing our evaluation of all the available data is presented. Several pertinent problems which are not yet completely understood and which still require theoretical and experimental investigation are outlined. Computed concentration, temperature and density time histories are shown for three different shock speeds in air. The time rate of change of concentration for each chemical reaction is also shown and regimes of importance for the various processes are discussed. (Author)

PB 159 508 $8.10

Florida U. Engineering and Industrial Experiment Station, Gainesville.
RESEARCH AND DEVELOPMENT ON INDUCTION HEATING METHODS OF SIMULATING AERODYNAMIC HEATING, by B. E. Mathews. Final rept. Phase 2, on Contract AF 33(616)5703, continuation of Contracts AF 33(038)9928, AF 33(600)682, and AF 33(616)3293. Mar 61, 88p. 4 refs. WADC Technical rept. 59-523, Part II; AD-254 698.

DESCRIPTORS: *Aerodynamic heating, Aluminum, *Induction heating, Simulation, Heat transfer, *Radiofrequency coils, Mathematical analysis, Stainless steel, Measurement, Temperature, Surfaces, Calorimeters, Thermocouples, Water coolers, Configuration, Instrumentation, Thermoelectricity, Test methods.

This study is Phase II of a program investigating various problems involved in using radio frequency induction heating as a means of simulating aerodynamic heating. Methods of experimentally determining the transfer efficiency of flat work coils are discussed. Surface temperature gradients produced on specimens heated by flat work coils are considered. Series of tests are reported where gradients were measured by thermocouples. These tests include experiments using various work-coil configurations, various power levels, and two types of specimen material--aluminum and stainless steel. Also included is an analytical approach which can be used to predict the gradients for a given set of test conditions. The last topic discussed is flexible, water-cooled work coils. (Author)

PB 159 454 $7.60

Lockheed Aircraft Corp., Marietta, Ga.
STEADY FLOW EJECTOR RESEARCH PROGRAM, by G. L. Rabeneck, P. K. Shumpert, and J. F. Sutton. Final rept. on Contract Nonr-3067(00). Dec 60, 77p. 5 refs. ER-4708; AD-251 179.

DESCRIPTORS: *Jet pumps, Design, Jets, Thrust, *Nozzles, *Thrust augmentor nozzles, Configuration, Tests, Diffusers, Jet mixing flow, Turbojet engines.

An investigation was conducted to determine the jet thrust augmentation under static conditions for rectangular parallel-divergent wall ejector configurations with multiple primary nozzles. The effect of various geometrical and flow parameters were investigated in order to provide design information. Parameters investigated included the ratio of the ejector exit area to the primary nozzle area, the diffuser angle, the mixing section length, the primary nozzle position, the entrance radius, the number of primary nozzle rows, and the primary nozzle pressure ratio and temperature ratio. The test results are generalized to obtain curves relating the augmentation factor to ejector geometry and flow parameters over a wide range of ejector exit to primary nozzle area ratios. (Author)

PB 157 811 $5.60

Vehicle Research Corp., Pasadena, Calif.
INTERNAL FLOW FOR GROUND EFFECT MACHINES, by T. Strand and T. Fujita. Rept. on Contract Nonr-3058(00). 15 Oct 60, 54p. 15 refs. VRC rept. no. 6; AD-245 114.

DESCRIPTORS: *Ground effect, Ducted fans, Turbofan engines, Airplanes, Aerodynamics, *Flying platforms, Vehicles, Airborne, Jets, Design, Mathematical analysis, Ducted bodies.

The internal flow requirements of peripheral jet GEMs are presented in terms of volume flow and jet exit total head, based upon the external flow field needed to sustain the vehicle in hovering and translation. The requirements are cast in a generalized form to be applicable to GEMs of arbitrary geometry, weight and operating height. System operating load lines are determined, as well as the jet exit gap/vehicle height ratio corresponding to the practical maximum power loading. The optimum diameter of the ducted single stage axial flow fan selected to provide the required flow, is found by deriving an expression for the sum of the fan and the duct losses and finding the diameter that will minimize this expression. It is shown that other variables being constant, low internal losses are obtained by designing for (1) low volume flow per fan, (2) low shaft angular velocity, i.e., large diameter fan, and (3) low duct loss coefficient. All GEM internal duct systems will probably require corner vanes to avoid separation and secondary flow losses. The theory of corner vane design using singularity methods is reviewed and later used to develop a new and improved series of corner vanes that are the cascade equivalents of the NACA, a = 1 (constant chordwise loading) airfoil sections. Improved corner vane design, the avoidance of diffusers and the use of smooth internal duct walls all tend to reduce the duct loss coefficient to a minimum value which can be estimated by a conventional skin friction analysis which is also included. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 157 519 $2.60

General Electric Co., Schenectady, N. Y.
SOME BASIC ASPECTS IN THE THEORY OF HYDRODYNAMIC GAS JOURNAL BEARINGS, by Coda H. T. Pan. Technical rept. on Contract Nonr-2844(00) 14 Sep 60, 28p. 3 refs; AD-245 464.

DESCRIPTORS: *Gas bearings, *Journal bearings, Theory, Mathematical analysis, Hydrodynamics.

Three aspects in the theory of hydrodynamic gas journal bearings are discussed: (1) Compatibility Condition - For an isothermal gas film, it is shown that a unique algebraic relation exists between the forces acting on the shaft, the instantaneous time derivative of the film mass, and the instantaneous net leakage flow through the ends. Since all theoretical results of an isothermal gas film are to satisfy this condition, it is given the name "compatibility condition". (2) Influence of Shaft Whirl - By a Galilean transformation, the differential equation of Reynolds and its boundary conditions are written in terms of a set of coordinates fixed with respect to the whirl motion of the shaft. For a steady whirl motion, the transformed equation is independent of time. The compatibility condition can also be expressed in terms of the moving coordinates. (3) Leakage Flow - The perturbation theory of Ausman [Inst. of Mech. Engineer's Proc. of Conf. on Lubrication and Wear, 1957:p. 39-45] is applied to the quasi-steady state problem in the moving coordinates. It is shown that the leakage flow does not vanish in the case of an infinitely long bearing. (Author)

LAMS-2567 $1.25

Los Alamos Scientific Lab., N. Mex.
THE PARTICLE-AND-FORCE COMPUTING METHOD FOR FLUID DYNAMICS, by Francis H. Harlow and Billy D. Meixner. Rept. on Contract W-7405-eng-36. Oct 61, 49p. 16 refs.

PB 159 292 $3.60

Mississippi State U. [State College].
THE BEHAVIOR OF THE WALL LAW CONSTANTS IN TURBULENT PIPE FLOW, by David L. Murphree. Research note no. 13 on Contract Nonr-978(01). 15 Jan 61, 31p. 13 refs. AD-250 062.

DESCRIPTORS: Errors, *Turbulent flow, Pipes, Mathematical analysis, Corrections.

Discrepancies that occur between the velocity profile predicted by the Law of the Wall and that obtained through experimental measurement, particularly for the case of turbulent pipe flow are examined. It is shown that the discrepancies between theory and experiment are due to the assumption that the intercept and slope A and B respectively, of the velocity profile when plotted as described by the Wall Law, are absolute constants independent of the flow conditions. This assumption is shown to yield erroneous results. Slope A, and intercept B, of the Wall Law are shown not to be absolute constants independent of the flow conditions, but are functions of the shearing stress and the pipe radii. These ranges of previously determined intercept and slope are of great enough magnitude to create a significant difference between the experimental results and that predicted by the Law of the Wall theory using one set of constants for all flow conditions. To determine whether these different values of the constants were due to experimental error, type of equipment used, test conditions, or whether different values of the constants actually do occur under different flow conditions is the purpose of this investigation. (Author)

PB 157 515 $6.60

Pneumodynamics Corp., Bethesda, Md.
GENERAL DESIGN CRITERIA FOR CABLE-TOWED BODY SYSTEMS USING FAIRED AND UNFARIED CABLE, by W. M. Ellsworth. Rept. on Contract Nonr-3201(00). Oct 60, 62p. 3 refs. TN-SEDU-6643-1; AD-252 870.

DESCRIPTORS: *Towing cables, *Electric cables, Tables, Design, Dynamics, Hydrodynamics, Oceanography, Instrumentation, Tensile properties, *Mechanical properties, Oceanographical data, Mechanics, *Towed bodies.

A method for rapid selection of design parameters to satisfy requirements for cable-towed instrument systems is described. The method is applied to both faired and unfaired cable systems. Curves are presented which facilitate the determination of cable diameter, cable length, and required down force without the need for performing laborius cable calculations previously required. (Author)

PB 159 300 $2.60

Rensselaer Polytechnic Inst., Troy, N. Y.
THE STABILITY OF NON-ROTATIONALLY SYMMETRIC DISTURBANCES FOR VISCOUS FLOW BETWEEN ROTATING CYLINDERS, by R. C. DiPrima. Rept. on Contract Nonr-591(08). 17 Jan 61, 21p. 12 refs. RPI MathRep no. 40; AD-250 819.

DESCRIPTORS: *Fluid flow, *Viscosity, Rotation, Cylindrical bodies, Stability, Reynolds number.

The stability of a viscous fluid between two concentric rotating cylinders to non-rotationally symmetric disturbances is investigated. It is assumed that the cylinders are rotating in the same direction and that the spacing between the cylinders is small. It is found that the critical Reynolds number increases slightly as the number of waves in the azimuthal direction in the assumed form of the disturbances increases. (Author)

IS-262 $0.50

Ames Lab., Iowa State U. of Science and Tech.
ARC MELTING IN THE TUNGSTEN ELECTRODE FURNACE, by D. E. Williams and H. L. Levingston. Rept. on Contract W-7405-eng-82. Nov 61, 17p. 9 refs.

ANL-6375 $0.50

Argonne National Lab., Ill.
THE EFFECT OF ADDITIVES ON THE DENSIFICATION OF URANIA-THORIA COMPOSITIONS, by George D. White. Final rept. on Contract W-31-109-eng-38. Nov 61, 19p. 9 refs.

PB 181 109 $2.75

Battelle Memorial Inst., Columbus, Ohio.
METALLURGICAL AND MECHANICAL CHARACTERISTICS OF HIGH-PURITY TITANIUM-BASE ALLOYS, by Albert G. Imgram, Dean N. Williams and others. Rept. for 1 Nov 59-31 Jan 60 on Metallic Materials, Contract AF 33(616)5462. Aug 61, 129p. 7 refs. WADD Technical rept. 59-595, Part II.

DESCRIPTORS: *Titanium alloys, Alloys, Aluminum alloys, Zirconium alloys, Hafnium alloys, Niobium alloys, Tungsten alloys, Chromium alloys, Vanadium alloys, *Metallurgy, Mechanical properties, Microstructure, Thermodynamics, Hardness, Aging, Tensile properties.

The relationships between mechanical properties, alloy composition, microstructure, and thermal history have been studied for high-purity titanium-base alloys. The alloy systems investigated include Ti-Al, Ti-Zr, Ti-Hf, Ti-Al-Zr, Ti-Al-Hf, Ti-Al-Cb, Ti-Cb, Ti-W, Ti-V-Cr, and Ti-V-Cr-Al. Mechanical-property data, including tensile and flow properties, impact behavior, hardness, aging, and cooling-rate data were determined. The metallurgical principles involved are discussed. (Author)

TID-14185 $2.60

Florida U. Engineering and Industrial Experiment Station, Gainesville.
AN EVALUATION OF THE ROLE OF DEFORMATION TWINNING IN THE PLASTIC DEFORMATION OF ZIRCALOY-2. Quarterly progress rept. no. 1, Sep 61, 23p. 14 refs.

GA-2235 $2.75

General Atomic Div., General Dynamics Corp., San Diego, Calif.
A PROGRAM OF RESEARCH ON MECHANICAL METALLURGY AS RELATED TO FUEL-ELEMENT FABRICATION, by T. A. Trozera, J. L. White and others. Rept. on Contract AT(04-3)-167. June 61, 157p. 40 refs.

HW-70612 $1.60

Hanford Atomic Products Operation, Richland, Wash.
EFFECT OF LOW HYDROGEN CONCENTRATIONS ON HALL EFFECT IN ZIRCALOY-2, by W. G. Magnuson, Jr. Rept. on Contract AT(45-1)-1350. Aug 61, 12p. 14 refs.

KAPL-M-SAT-7 $1.10

Knolls Atomic Power Lab., Schenectady, N. Y.
JOINING B^{10} STAINLESS STEEL PLATES BY THE RESISTANCE FOIL-SEAM WELDING PROCESS, by S. A. Toftegaard and N. Norton. Rept. on Contract W-31-109-eng-52. Oct 61, 10p.

PB 159 457 $19.75

Lockheed Aircraft Corp., Burbank, Calif.
DEVELOPMENT OF FLASHWELDING TECHNIQUES FOR NON-FERROUS ALLOYS, by Mario L. Ochieano. Final technical engineering rept. 1 Nov 52-15 Dec 59, on Contract AF 33(600)22246. Mar 60, 304p. 17 refs. AMC Technical rept. 60-7-250a. AD-239 538.

DESCRIPTORS: *Aluminum alloys, *Flash welds, Corrosion, Coatings, Specifications, Airframes, Mechanical properties, Heat treatment, Aging, Microstructure.

Flashwelding techniques and machine set-up data curves have been developed, for 6061, 2014, 2024 and 7075 aluminum alloys which produced flash weldments possessing acceptable quality, ductility and fatigue life. The static strength levels of developed welds were equal to or greater than the minimum strengths of the parent metal. A proposed Military Specification is presented. (Author)

PB 181 111 $3.00

Manufacturing Labs., Inc., Cambridge, Mass.
RESEARCH AND DEVELOPMENT ON HIGH-PRESSURE-HIGH-TEMPERATURE METALLURGY, by L. Kaufman, S. V. Radcliffe and others. Rept. for Oct 59-Feb 61 on Metallic Materials, Contract AF 33(616)6837. Aug 61, 170p. 78 refs. WADD Technical rept. 60-893.

DESCRIPTORS: *Metallurgy, *High pressure research, *High temperature research, *Iron alloys, Chromium alloys, Nickel alloys, Silicon alloys, Carbon alloys, Alloys, Phase transitions, Transformations, *Hydrostatic pressure, Pressure, Temperature, Refractory materials, Synthesis, Hall effect, Brittle materials, Materials, Sintering.

The experimental investigations on the effect of high hydrostatic pressure on phase transformations in various substitutional iron-base alloys, including iron-chromium, iron-nickel and iron-silicon, yield data which are in close agreement with theoretical prediction. A study of the effects of pressure on iron-carbon alloys shows a general shift of the equilibrium phase boundaries to lower carbon contents and temperatures with pressure. Pressure also acts to retard both the rate of tempering and the isothermal transformation of metastable austenite. The synthesis of f.c.c. MoC has been carried out at pressures in excess of 35 kilobars at a temperature of 2000°C. The thermally activated recovery and recrystallization processes are shown to be retarded in a study of copper and 70-30 brass. Experimental data have been obtained for the effect of pressure on the Hall voltage of cerium. Preliminary studies have been carried out on the high pressure sintering of Al_2O_3. (Author)

ORNL-TM-51 $2.60

Oak Ridge National Lab., Tenn.
CATASTROPHIC OXIDATION OF HIGH-TEMPERATURE ALLOYS, by J. H. DeVan. Nov 61, 26p.

ORNL-TM-40 $1.60

Oak Ridge National Lab., Tenn.
FABRICATION OF BOILER SECTION FOR BOILING-LIQUID-METAL LOOP, by E. A. Franco-Ferreira. Oct 61, 16p.

ORNL-TM-39 $5.60

Oak Ridge National Lab., Tenn.
AN INVESTIGATION OF THE HIGH-TEMPERATURE PROPERTIES OF THE AISI TYPE 502 STEEL, by W. R. Martin and H. E. McCoy, Jr. Rept. on Contract W-7405-eng-26. Nov 61, 54p.

ORNL-3197 $1.60

Oak Ridge National Lab., Tenn.
RECORDING EQUIPMENT FOR INTERNAL FRICTION MEASUREMENTS, by R. L. Stephenson and H. E. McCoy, Jr. Rept. on Contract W-7405-eng-26. Oct 61, 13p.

OTS SB-441, Rev. $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
EXPLOSIVE METAL FORMING. Dec 61, 6p. 66 refs. OTS Selective Bibliography SB-441, rev.

DESCRIPTORS: *Metals, *Explosive forming, *Bibliography

Lists 66 references on explosive metal forming. Includes reports on high energy rate forging, high impact forming, use of explosive energy in metal-working operations, and use of the Dynapak machine. (Author)

PB 181 115 $3.00

Research Chemicals, Inc., Burbank, Calif.
PROPERTIES OF YTTRIUM AND THE RARE EARTH METALS OXYGEN AND ALLOY SYSTEMS. OXYGEN AND ALLOY SYSTEMS, by Bernard Love. Rept. for Oct 59-Oct 60 on Metallic Metals, Contract AF 33(616)6829. Aug 61, 198p. 49 refs. WADD Technical rept. 61-123.

DESCRIPTORS: *Rare earths, *Rare earth elements, *Oxygen, *Alloys, Yttrium, Tantalum, Erbium, Samarium, Neodymium, Cobalt, Nickel, Beryllium, Zirconium, Preparation, Chemical analysis, Spectrographic analysis, Corrosion, Tests, X-ray diffraction analysis, Mechanical properties, Purification, Phase studies

Alpha yttrium and erbium are miscible. In the yttrium-neodymium system there is partial solubility and an

intermediate phase is present. The solubility of oxygen is low in yttrium, erbium, neodymium, and samarium. Alpha-beta transformations are essentially unaffected. A high temperature monoxide is proposed. The solubility of erbium in cobalt is low. The first compound is $Co_{17}Er_2$. Tantalum and niobium form extensive liquid immiscibility regions with rare earths, terminating in a monotectic near the tantalum (niobium) end of the systems; a eutectic at the rare earth end. Solubility is very low. Improved atmospheric corrosion resistance was found for some niobium and cobalt compositions with rare earth additions. The tensile properties of yttrium were improved by alloying with erbium or zirconium. Purification of yttrium and erbium, and improved analytic methods are described. Beryllium with erbium additions shows grain refinement. (Author)

SCR-306 $1.75

Stevens Inst. of Tech., Hoboken, N. J.
DEVELOPMENT OF MILITARY COMPONENTS FROM BERYLLIUM BY SLIP CASTING AND POWDER METALLURGY TECHNIQUES. Final rept. Sep 59-Sep 60. Dec 61, 74p.

PB 159 456 $5.60

Value Engineering Co., Alexandria, Va.
BIBLIOGRAPHY ON OXIDATION AND EROSION RESISTANT COATINGS FOR MOLYBDENUM, TUNGSTEN AND TANTALUM [by J. Huminik and C. H. Wright]. Rept. on Contract DA 36-034-ORD-3270 RD. 30 Aug 60, 57p. 157 refs.

DESCRIPTORS: *Molybdenum, *Tungsten, *Tantalum, Oxidation, Deterioration, Countermeasures, *Coatings, *Bibliography.

The aim of this bibliography has been to include only the more important references which could be related to improving of the erosion and oxidation resistance of these metals; it is divided into two sections, one dealing with Patents and the other dealing with the General Literature and unclassified Government Reports. It will be noted that most of the survey concentrated on the period since 1955. (Author)

Structural Metallurgy and Corrosion

TID-13691 $1.60

Battelle Memorial Inst., Columbus, Ohio.
CORROSION INVESTIGATION OF HyMu-80 UNDER FLUORINATION CONDITIONS, by F. W. Fink, P. D. Miller, and E. F. Stephan. Sep 61, 11p.

PB 181 112 $1.00

Martin Co., Baltimore, Md.
THE EFFECT OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL PROPERTIES OF METALS. PART I. THE EFFECT OF SURFACE-REMOVAL ON THE PLASTIC BEHAVIOR OF ALUMINUM SINGLE CRYSTALS, by I. R. Kramer. Rept. for Jan 60-Jan 61 on Research on New Chemical Systems and Methods of Synthesis, Contract AF 33(616)6220. Apr 61, 35p. 32 refs. WADD Technical rept. 61-58, Part I.

DESCRIPTORS: *Aluminum, Single crystals, Plastic flow, Surface area, Surface properties, Shear stresses, Stresses, *Metals, Mechanical properties, Detergents, Wetting agents, Electrolytic cells, Chemical reactions.

Aluminum single crystals were pulled in an electrolytic cell and the surface of the crystal was removed during the deformation. The extent of Stages I and II was increased and their slopes decreased as the rate of metal removed from the surface was increased. Increasing the strain rate caused a decrease in the extent of Stages I and II and increased the slopes. The experimental data indicate that the work-hardening coefficient of Stage I is determined primarily by the conditions which exist on the surface of the crystal. In Stages II and III, both surface effects and internal barriers are important. (Author)

PB 181 113 $0.75

Martin Co., Baltimore, Md.
THE EFFECT OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL PROPERTIES OF METALS. PART II. THE EFFECT OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL BEHAVIOR OF ALUMINUM SINGLE CRYSTALS, by I. R, Kramer. Rept. for Jan 60-Jan 61 on Research on New Chemical Systems and Methods of Synthesis, Contract AF 33(616)6220. Apr 61, 25p. 22 refs. WADD Technical rept. 61-58, Part II.

DESCRIPTORS: *Aluminum, Single crystals, *Metals, Mechanical properties, Shear stresses, Stresses, Mineral oils, Oils, Stearic acids, Acids, Detergents, Wetting agents, Chemical reactions, Metallic soaps, Solubility, Production, Plastic flow

Single crystals of aluminum were pulled in tension in a solution of paraffin oil and stearic acid. The critical resolved shear stress did not change with the concentration of the stearic acid solution; however, the extent and slopes of Stages I and II were affected greatly. The observations lend evidence that the weakening effect of surface-active agents is controlled by the rate of desorption of the metal soap formed by the reaction of the surface-active agent and the metal surface. (Author)

ORNL-3230 $1.25

Oak Ridge National Lab., Tenn.
EFFECT OF HEAT FLUX ON THE CORROSION OF ALUMINUM BY WATER. PART III. TESTS RELATIVE TO THE HIGH-FLUX ISOTOPE REACTOR, by J. C. Griess, H. C. Savage and others. Rept. on Contract W-7405-eng-26. 52p. 21 refs.

AD-268 623 $1.00

Rock Island Arsenal Lab., Ill.
ACCELERATED CONDENSATION APPARATUS FOR THE EVALUATION OF INHIBITED OIL FILMS, by Van Y. S. Hong. 28 Sep 61, 32p. 10 refs. Rept. no. 61-3558.

DESCRIPTORS: *Corrosion inhibition, *Oils, Tests, Test equipment, *Humidity cabinets, Design, Operation, Condensation.

An accelerated condensation apparatus for the assessment of inhibited oil films was developed which includes accessory equipment and procedures. Experimental data on sixteen current rust preventives indicated that the efficiency of the evaluation improved with an increase of temperature differentials and condensation rate. This improvement was measured in terms of test time, precision, and sensitivity. (Author)

AD-268 168 $0.75

Rock Island Arsenal Lab., Ill.
ENZYMATIC DEOXYGENATION: A NEW CONCEPT IN CORROSION PREVENTION, by W. F. Garland. 9 Oct 61, 29p. 17 refs. Rept. no. 61-3681.

DESCRIPTORS: Metals, Corrosion inhibition, Glucose, Oxidases, Catalase, *Enzymes, Effectiveness, Deoxidation, *Corrosion research, *Oxidation-reduction reactions

A new concept for corrosion prevention of metals, called enzymatic deoxygenation, was evaluated. The removal of oxygen from the package will reduce the oxidation process and thereby provide protection. The process is based on the specificity of the enzyme glucose oxidase for causing molecular oxygen to be utilized in reactions. Two commercially prepared types of enzyme packets and one commercial redox system were investigated for deoxygenating effectiveness and use in corrosion prevention. Only one type of commercially prepared enzyme packet proved adequate; the redox system proved ineffective. Various adsorbants, silica gel, Santo cel, diatomaceous earth, synthetic sponge and molecular sieves as well as various plastic films were utilized in fabricating packets containing an enzyme concentrate. A prototype enzymatic deoxygenating packet was fabricated from 4 mls of 1:5 enzyme concentrate/buffered glucose solution deposited on 7 grams of molecular sieves and heat sealed in 1/2 mil low density polyethylene. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

BMI-X-179 $1.60

Battelle Memorial Inst., Columbus, Ohio.
RADIOISOTOPE AND RADIATION APPLICATIONS, ed. by Duane N. Sunderman. Quarterly progress rept. no. 10, 1 July-30 Sep 61, on Contract W-7405-eng-92. Oct 61, 17p.

WAPD-T-1234 $1.60

Bettis Atomic Power Lab., Pittsburgh, Pa.
THE APPLICATION OF A THERMAL GROUP MODEL FOR ACTIVATION CALCULATIONS, by D. R. Connors, R. J. Breen and others. July 61, 18p.

PB 159 266 $6.60

California U., Berkeley.
DYNAMIC POLARIZATION OF NUCLEI BY ELECTRON-NUCLEAR DIPOLAR COUPLING IN CRYSTALS, by O. S. Leifson and C. D. Jeffries. Technical rept. no. 6 on Contract Nonr-222(61). Jan 61, 70p. 49 refs. AD-251 224.

DESCRIPTORS: *Nuclear spins, *Protons, Cerium, Paramagnetic resonance, Polarization, Magnetic fields, Microwave frequency, *Crystals, Mathematical analysis, Nuclei.

An investigation was made of the dynamic polarization of the protons in $(Ce, La)_2 Mg_3(NO_3)_{12} \cdot 24H_2O$ which occurs when one saturates the forbidden microwave transitions that simultaneously flip a proton spin and a $Ce^{(3+)}$ electron spin. The rate equations for the electron and nuclear polarization are solved for (a) a simple ideal model: (b) a model for the case where the forbidden lines are not resolved; and (c) a model taking into account nuclear spin temperature diffusion. An apparatus for simultaneous observation of proton magnet magnetic resonance and $Ce^{(3+)}$ paramagnetic resonance at liquid helium temperatures is described. The proton polarization is observed for a number of different concentrations of $Ce^{(3+)}$. The magnitude of the polarization, its dependence on magnetic field and microwave power, and the transient behavior are qualitatively explained. In a crystal containing 1% Ce, the proton polarization is observed to become greater than the thermal equilibrium value by the factor 150, which is about one-quarter of the theoretical ideal. (Author)

UCLA-484 $2.60

California U. Los Angeles. School of Medicine, Los Angeles.
COUNTING OF α - AND β - RADIATIONS IN AQUEOUS SOLUTIONS BY THE DETERGENT-ANTHRACENE SCINTILLATION METHOD, by L. S. Myers, Jr. and A. H. Brush. Rept. on Contract AT(04-1)-GEN-12. July 61, 26p. 13 refs.

TID-12849 $9.10

Carnegie Inst. of Tech., Pittsburgh, Pa.
NUCLEAR CHEMISTRY RESEARCH AT CARNEGIE INSTITUTE OF TECHNOLOGY 1960-1961. Progress rept. on Contract AT(30-1)-844. June 61, 89p.

PB 159 265 $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
SELF-CONSISTENT FIELD THEORY OF NUCLEAR SHAPES, by Michel Baranger. Technical rept. no. 5 on Contract Nonr-760(15). [1960] 20p. 20 refs; AD-249 126.

DESCRIPTORS: Potential theory, *Nuclear shell models, Spheres, Equations.

The Hartree-Fock equations are generalized to include pairing effects on the same footing with field-producing effects. In addition to the Hartree potential, there enters a pairing potential. When applied to a spherically symmetric shell-model Hamiltonian, these equations may possess deformed solutions. Application is made to pairing plus quadrupole forces, with results identical to those of Belyaev and Kisslinger and Sorensen. The spherical shape becomes unstable when some collective vibration of the spherical nucleus reaches zero frequency. (Author)

CEND-1008 $4.60

Combustion Engineering, Inc., Idaho Falls.
SL-1. Quarterly progress rept. 1 Oct-Dec 60, on Contract AT(10-1)-967. Sep 61, declassified. 41p. IDO-19023.

GA-2438 $2.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THE CALCULATION OF THERMAL-NEUTRON SCATTERING KERNELS IN GRAPHITE, by D. E. Parks. Rept. on Contract AT(04-3)-314. Oct 61, 56p.

GA-2563 $2.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THE CONTRIBUTION OF THE INDIVIDUAL RESONANCES TO THE RESONANCE INTEGRALS IN URANIUM AND THORIUM, by L. W. Nordheim. Rept. on Contract AT(04-3)-167. Oct 61, 26p.

GA-2344 $1.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
FISSION OF A HOT PLASMA, by Norman Rostoker and Alan C. Kolb. July 61, 17p. 13 refs.

HW-71747 $2.25

Hanford Atomic Products Operation, Richland, Wash.
PHYSICS RESEARCH. Quarterly rept. July-Sep 61, on Contract AT(45-1)-1350. Oct 61, 91p.

TID-14040 $5.60

Illinois U., Urbana.
QUADRUPOLAR NUCLEAR RELAXATION IN THE III-V COMPOUNDS, by Robert L. Mieher. [1961] 55p. 42 refs.

KAPL-M-NCF-3 $1.10

Knolls Atomic Power Lab., Schenectady, N. Y.
NON-LINEAR EQUATION VARIATIONAL METHOD, by N. C. Francis. Rept. on Contract W-31-109-eng-52. July 61, 7p.

UCRL-9850 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
THE MOMENTS, SPINS, AND HYPERFINE STRUCTURES OF THE RADIOACTIVE ISOTOPES: I^{133} (21-hr), Nd^{141} (2.5-hr), Eu^{152} (13-yr), AND Bi^{210} (5-day), by Seymour S. Alpert. Rept. on Contract W-7405-eng-48. Sep 61, 125p. 73 refs.

UCRL-6526 $3.50

Lawrence Radiation Lab., U. of California, Livermore.
NEUTRON SELF-SHIELDING IN ONE-DIMENTIONAL ABSORBERS, by John S. Martinez. Rept. on Contract W-7405-eng-48. Sep 61, 252p. 159 refs.

UCRL-9919 $1.25

Lawrence Radiation Lab., U. of California, Berkeley.
POLARIZATION OF THE PROTONS FROM HYPERON DECAY, by Edgar F. Beall. Rept. on Contract W-7405-eng-48. Oct 61, 75p. 47 refs.

UCRL-9099 $12.00

Lawrence Radiation Lab., U. of California, Berkeley.
REFERENCE MANUAL FOR KICK IBM PROGRAM, ed. by Arthur H. Rosenfeld. Rept. on Contract W-7405-eng-48. May 61, 167p.

UCRL-9606 $1.75

Lawrence Radiation Lab., U. of California, Berkeley.
REGENERATION OF θ_1 MESONS IN A THIRTY-INCH PROPANE BUBBLE CHAMBER, by Robert H. Good. Rept. on Contract W-7405-eng-48. July 61, 79p. 40 refs.

UCRL-9846 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
STUDIES OF FAST EXCHANGE REACTIONS BY THE USE OF NUCLEAR MAGNETIC RESONANCE. PART I. IODINE EXCHANGE IN AQUEOUS TRIIODIDE SOLUTIONS. PART II. EXCHANGE OF COORDINATED WATER MOLECULES IN AQUEOUS FERRIC SOLUTIONS, by Edward Easley Genser. Rept. on Contract W-7405-eng-48. Jan 62, 99p. 39 refs.

NAS-NS-3104 $1.25

Michigan U., Ann Arbor.
RAPID RADIOCHEMICAL SEPARATIONS, by Yusuru Kusaka and W. Wayne Meinke. Dec 61, 130p. 273 refs.

MLM-1124 $0.50

Mound Lab., Miamisburg, Ohio.
LOW TEMPERATURE RESEARCH ON POLONIUM-210, by E. W. Wiederhold, J. W. Snider, and R. J. Spry. Rept. on Contract AT(33-1)-GEN-53. Dec 61, 11p. 4 refs

PB 159 268 $1.10

Noyes Chemical Lab., U. of Illinois, Urbana.
NUCLEAR MAGNETIC SPIN-LATTICE RELAXATION BY SPIN-ROTATIONAL INTERACTIONS, by H. S. Gutowsky, I. J. Lawrenson, and K. Shimomura (Hiroshima U.). Technical rept. no. 40 on Contract Nonr-1834(13). 26 Jan 61, 8p. 7 refs. AD-252 195.

DESCRIPTORS: *Nuclear spins, Nuclear reactions, *Nuclear magnetic resonance, Lattices, Nuclear magnetic dipole moments, Molecules, Fluorocarbons, Fluorides, Chlorides, Benzenes, Methyl radicals, Nuclear magnetic moments, Protons, Theory

Experimental evidence is presented to show that spin-rotational interactions provide the dominant relaxation mechanism in certain molecular liquids. The discussion is based on the proton and fluorine spin-lattice relaxation time (T) of the proton and fluorine in CH_2FCl, CHF_2Cl, $CHFCl_2$ and 1, 3, 5-trifluorobenzene. Theoretical considerations of dipolar and anisotropic contributions to T indicated that another factor was involved. The additional factor, spin-rotational interaction, was indicated by measurements of the temperature dependence of the proton and fluorine T's. Graphical representation of temperature and T for both the proton and fluorine showed curvature instead of straight lines with increase in temperatures, indicating deviations from ideal behavior. The deviations were larger for fluorine than for the proton, this fact together with the observed effects of temperature on the proton T/fluorine T ratio can be explained by the spin-rotation interaction.

ORNL-3185 $0.50

Oak Ridge National Lab., Tenn.
SEPARATION OF TRANSPLUTONIUMS FROM LANTHANIDES BY TERTIARY AMINE EXTRACTION, by R. D. Baybarz and Boyd Weaver. Rept. on Contract W-7405-eng-26. [1961] 23p. 18 refs.

IDO-16029 $1.10

Phillips Petroleum Co., Idaho, Falls.
REACTIVITY PERTURBATIONS DUE TO LOCALIZED ABSORBERS IN THE MTR, by H. L. McMurry. Nov. 61, 5p.

ORNL-TM-59 $1.10

Oak Ridge National Lab., Tenn.
OPTIMUM FILL VOLUMES IN POT CALCINATION OF RADIOACTIVE WASTES, by J. J. Perona. Nov 61, 5p.

TID-13586 $2.60

Purdue Research Foundation, Lafayette, Ind.
NUCLEAR SPECTROSCOPY AND THE APPLICATION OF RADIOISOTOPES TO THE STUDY OF REACTION KINETICS, by D. C. Conway. Progress rept. 1 Aug 60-31 July 61, on Contract AT(11-1)-694. July 61, 24p. 13 refs.

TID-13666 $4.50

Purdue U., Lafayette, Ind.
TABLES FOR THE ANALYSIS OF β-γ ANGULAR CORRELATION DATA INVOLVING FIRST-FORBIDDEN β-TRANSITIONS IN A 3^- (β) → 2^+ (γ) → O^+ CASCADE, by P. Alexander and R. M. Steffen. Rept. on Contract AT(11-1)-123. Aug 61, 379p.

NYO-2530 $2.60

Radiation Applications, Inc., Long Island City, N. Y.
THE ACCELERATING EFFECT OF ADDITIVES ON RADIATION-INDUCED GRAFT POLYMERIZATION, by George Odian and Terese Acker. Quarterly summary rept. 1 Apr -30 June 61, on Contract AT(30-1)-2318. July 61, 21p.

NYO-9967 $8.60

Rensselaer Polytechnic Inst., Troy, N. Y.
HIGH INTENSITY RADIATION CHEMISTRY, by P. Harteck and S. Dondes. Summary rept. on Contract AT(30-3)-321. Oct 61, 90p. 17 refs.

TID-13917 $2.60

Stanford Research Inst., Menlo Park, Calif.
RADIATION STABILITY OF ORGANIC LIQUIDS, by A. H. Samuel and R. S. Farrand. Semi-annual rept. no. 2, 1 Feb-31 July 61, on Contract AT(04-3)-115. 23p. 6 refs. SRI proj. no. PU-3501.

PB 158 639 $1.10

Washington U., St. Louis, Mo.
AN EXPLORATION OF THE POSSIBILITY OF EMPLOYING ULTRASONIC RADIATION TO SENSITIZE A BUBBLE CHAMBER, by A. L. Hughes. Technical rept. no. 7 on Cosmic Rays, Contract Nonr-816, T. O. 09. Dec 60, 6p. 1 ref. AD-251 993.

DESCRIPTORS: *Ionization chambers, *Bubbles, *Ultrasonic radiation, Ionization, Cosmic rays, Instrumentation, Liquids, Cavitation.

Experiments were initiated to explore the possibilities of using an ultrasonically excited liquid as a bubble chamber. Various liquids were studied (water, water saturated with CO_2, isopentane, isopentane with dissolved ethylene). The ultrasonic radiation was provided by quartz and barium titanate transducers covering a range from 10 to 500 kc. The ionizing radiation included x-rays, beta rays, from radioactive isotopes, and nuclei knocked-on by neutrons of energy 10 to 23 mev. In practically every case, the ordinary cavitation produced in the liquid by ultrasonic radiation masked the effect, if any, that could be caused by the ionizing radiation.

TID-14213 $1.60

Wisconsin U., Madison.
POLARIZATION OF $Li^7(p,n)Be^7$ NEUTRONS FOR 4 TO 10 MEV PROTONS, by W. Benenson, T. H. May and R. L. Walter. [1961] 15p. 16 refs.

Instruments and Installations

UCOL-P-508 $2.60

Colorado U., Boulder
PROGRESS REPORT, on Contract AT(11-1)-535. Nov 61, 26p.

Portions of this report will not reproduce well.

LA-2575 $2.60

Los Alamos Scientific Lab., N. Mex.
A HEAT TREATMENT WHICH EXTENDS THE USABLE RANGE OF $AgPO_3$ GLASS DOSIMETERS, by P. K. Lee, E. R. Ballinger, and W. H. Schweitzer. Rept. on Contract W-7405-eng-36. Sep 61, 22p. 4 refs.

ORNL-3126 $1.50

Oak Ridge National Lab., Tenn.
THE ORNL BADGE DOSIMETER AND ITS PERSONNEL MONITORING APPLICATIONS, by W. T. Thornton, D. M. Davis, and E. D. Gupton. Rept. on Contract W-7405-eng-26. [1961] 60p.

TID-14187 $1.10

Rensselaer Polytechnic Inst., Troy, N. Y.
LINEAR ACCELERATOR PROJECT. Progress rept. July-Oct 61, on Contract AT(30-3)-328. 13 Nov 61, 10p.

DP-659 $0.50

Savannah River Lab., Aiken, S. C.
A TRAVELING FLUX MONITOR FOR EXPONENTIAL PILES, by William J. Woodward. Rept. on Contract AT(07-2)-1. Oct 61, 16p.

CTSL-30 $5.60

Synchrotron Lab., Calif. Inst. of Tech., Pasadena.
AN ACHROMATIC INFLECTOR FOR THE CALTECH SYNCHROTRON, by J. H. Mullins. Rept. on Contract AT(11-1)-68. Aug 61, 51p.

TID-14180 $6.60

W. W. Hansen Labs. of Physics, Stanford U., Calif.
LINEAR ELECTRON ACCELERATOR STUDIES. PROPOSED TWO-MILE ACCELERATOR PROJECT. Combined status rept. 1 July-30 Sep 61, on Contracts AT(04-3)-21 and AT(04-3)-363. Oct 61, 62p. ML-859; M-280.

Nuclear Engineering and Power

AGN-TM-364 $1.00

Aerojet-General Nucleonics, San Ramon, Calif.
TEMPERATURE DISTRIBUTION IN A UO_2 FUEL PELLET AND SURROUNDING METAL WALL, by J. L. Routbort. Rept. on Contract AT(10-1)-880. Oct 59, 33p.

ACNP-6119 $9.60

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
PATHFINDER ATOMIC POWER PLANT. Technical progress rept. Apr-June 61, on Contract AT(11-1)-589. Oct 61, 127p.

TID-8537 $2.50

Atomic Energy Commission. Div. of Technical Information Extension, Oak Ridge, Tenn.
STATUS OF THE APPLICATION OF NUCLEAR REACTORS IN THE PROCESS INDUSTRIES. Dec 61, 134p. 24 refs.

BMI-X-178 $1.60

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF URANIUM MONONITRIDE, by Donald L. Keller, Quarterly progress rept. July-Sep 61, on Contract W-7405-eng-92. Oct 61, 11p.

ORO-506 $1.60

Clevite Corp., Cleveland, Ohio.
FUEL-BEARING FIBERGLAS IN ALUMINUM BASE FUEL ELEMENTS, by R. H. Baskey. Quarterly rept. no. 8, 1 July-30 Sep 61, on Contract AT(40-1)-2557. Oct 61, 16p.

CEND-87 $5.60

Combustion Engineering, Inc., Windsor, Conn.
THE DEVELOPMENT AND TESTING OF HOMOGENEOUS CERAMIC FUELS. Summary rept. on Contract AT(30-1)-2379. May 60, 52p. NYO-2991.

IDO-19032 $4.60

Combustion Engineering, Inc., Windsor, Conn.
EVALUATION OF SL-1 POISON STRIPS, by J. Kozol, D. E. Nulk, and W. P. Chernock. Rept. on Contract AT(10-1)1967. Aug 61, 45p. CEND-143.

GNEC-202 $10.10

Combustion Engineering, Inc., Windsor, Conn.
NUCLEAR SUPERHEAT DEVELOPMENT PROGRAM. 9th quarterly progress rept. no. 9, July-Sep 61, on Contract AT(11-1)-795. 131p. In cooperation with General Nuclear Engineering Corp., Dunedin, Fla.

CEND-135(Vol. V) $14.00

Combustion Engineering, Inc., Windsor, Conn.
PL FINAL DESIGN. CORE DRAWINGS AND SPECIFICATIONS. Rept. on Contract AT(10-1)-967. June 61, declassified 14 Nov 61, 208p. IDO-19030(Vol. V).

CEND-135(Vol. I) $15.50

Combustion Engineering, Inc., Windsor, Conn.
PL FINAL DESIGN. PLANT DESIGN. Rept. on Contract AT(10-1)-967. June 61, declassified 14 Nov 61, 231p. IDO-19030(Vol. I).

CEND-135(Vol. II) $19.75

Combustion Engineering, Inc., Windsor, Conn.
PL FINAL DESIGN. PLANT DRAWINGS. Rept. on Contract AT(10-1)-967. June 61, declassified 14 Nov 61, 337p. IDO-19030(Vol. II).

CEND-135(Vol. III) $23.50

Combustion Engineering, Inc., Windsor, Conn.
PL FINAL DESIGN. PLANT EQUIPMENT SPECIFICATIONS. Rept. on Contract AT(10-1)-967. June 61, declassified 14 Nov 61. 458p. IDO-19030(Vol. III).

CEND-135(Vol. IV) $12.50

Combustion Engineering, Inc., Windsor, Conn.
PL FINAL DESIGN. REACTOR DESIGN. Rept. on Contract AT(10-1)-967. June 61, declassified 14 Nov 61, 177p. IDO-19030(Vol. IV).

RFP-248 $0.50

Dow Chemical Co., Denver, Colo.
INDUSTRIAL CRITICALITY MEASUREMENTS ON ENRICHED URANIUM AND PLUTONIUM PART II, by C. L. Schuske, C. L. Bell and others. Rept. on Contract AT(29-1)-1106. Jan 62, 20p.

GA-2385 $2.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THE EXPERIMENTAL BERYLLIUM OXIDE REACTOR, by W. C. Moore. Rept. on Contract AT(04-3)-187. July 61, 29p. 4 refs.

GAMD-2154 $1.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HTGR PRESSURE AND DIFFERENTIAL PRESSURE INSTRUMENTS, by J. T. Bauer. Rept. on Contract AT(04-3)-314. Mar 61, 16p.

GA-1532 $2.75

General Atomic Div., General Dynamics Corp., San Diego, Calif.
MARITIME GAS-COOLED REACTOR PROGRAM. Quarterly progress rept. for period ending June 60, on Contract AT(04-3)-187. 147p.

GA-1738 $2.50

General Atomic Div., General Dynamics Corp., San Diego, Calif.
MARITIME GAS-COOLED REACTOR PROGRAM. Quarterly progress rept. for the period ending Sep 60, on Contract AT(04-3)-187. 114p.

GAMD-2363 $1.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
SURVEY OF DATA ON THE IRRADIATION EFFECTS OF ALUMINA AND INCONEL-X (PART I), LONG TERM CREEP RUPTURE DATA ON INCONEL-X IN THE ABSENCE OF RADIATION (PART II) by W. L. Kosiba. Rept. on Contract AT(04-3)-187. June 61, 18p.

GAMD-1572 $4.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THERMAL DESIGN OF THE PRESSURE VESSEL AND THERMAL SHIELDS OF MGCR, by J. T. Rogers and G. J. Malek. Rept. on Contract AT(04-3)-187. Aug 60, 47p. 6 refs.

PB 159 467 $5.60

[General Dynamics]/Fort Worth, Tex.
ASTR FAST-NEUTRON AND GAMMA-RAY SPECIAL MEASUREMENTS, by A. N. Gabro and L. G. Mooney. Rept. on Contract AF 33(600)38946. 15 Jan 61, 56p. 6 refs. NARF-60-21T; MR-N-263; AD-252 292.

DESCRIPTORS: *Gamma-rays, *Fast neutrons, *Test reactors, Airborne, Spectrographic analysis, Shielding, *Nuclear propulsion

Spectra of γ-ray and fast-neutron radiation from the Airborne Shield Test Reactor (ASTR) are determined. γ-Ray spectral measurements are presented for the following experimental arrangements: (1) In a horizontal plane through the centerline of the ASTR, at $\theta = 0$ through 180° at a 63-ft separation distance, for ASTR Configuration 3 with the boral cover on the ASTR and the ASTR shield water borated, and using a collimated detector; (2) In the small cylinder (Geometry D), at $\theta = 0^{\circ}$, at a 33-ft separation distance, for ASTR Configuration 3 with the boral cover off the ASTR and the ASTR shield water not borated, and using a bare-crystal, uncollimated detector. Fast-neutron spectral measurements were made in a horizontal plane through the centerline of the ASTR at a 33-ft separation distance and are presented for: (1) $\theta = 0$, 105, and 120° for ASTR Configuration 3; (2) $\theta = 105^{\circ}$ for ASTR Configuration 5; (3) $\theta = 90^{\circ}$ for ASTR Configuration 15. (Author)

GEMP-103A $0.50

General Electric Co., Cincinnati, Ohio.
SUMMARY OF HIGH TEMPERATURE MATERIALS WORK PERFORMED IN FY 61, PART A. Rept. 1 May-30 June 61, on Contract AT(40-1)-2847. Dec 61, 19p.

GEAP-3485 $12.00

General Electric Co., San Jose, Calif.
300 KWe CAPSULE NUCLEAR POWER PLANT STUDY. Final rept. on Contract AT(04-3)-189. Aug 60, rev. Dec 60, 167p. 10 refs.

GEAP-3764 $0.50

General Electric Co., San Jose, Calif. DETERMINATION OF LIFETIME OF THE B_4C-IN-TUBES CONTROL ROD, by F. H. Megerth. Rept. on Contract AT(04-3)-189. July 61, 21p. 7 refs.

HW-69882 $5.60

Hanford Atomic Products Operation, Richland, Wash. DR-1 GAS LOOP THERMAL AND FLUID FLOW ANALYSES, by R. E. Baars. June 61, 52p.

HW-70453 $1.60

Hanford Atomic Products Operation, Richland, Wash. AN EDDY CURRENT TECHNIQUE FOR MEASURING THE PROCESS-TO-SHROUD TUBE ANNULUS IN THE PRTR, by J. C. Spanner. Rept. on Contract AT(45-1)-1350. July 61, 18p.

HW-61989 $1.10

Hanford Atomic Products Operation, Richland, Wash. EXPERIMENTAL PROGRAM FOR THE PRTR GAS LOOP, by D. E. Baker. Sep 59, 9p.

HW-71500A $1.75

Hanford Atomic Products Operation, Richland, Wash. THE H-3 IRRADIATION EXPERIMENT: IRRADIATION OF EGCR GRAPHITE, by J. M. Davidson and J. W. Helm. Interim rept. no. 1, on Contract AT(45-1)-1350. Oct 61, 65p. 17 refs.

HW-63411 $2.60

Hanford Atomic Products Operation, Richland, Wash. IDIOT. A LATTICE PARAMETER CODE FOR THE IBM-709, by C. R. Richey. Rept. on Contract AT(45-1)-1350. Jan 60, 27p.

HW-69861 $3.60

Hanford Atomic Products Operation, Richland, Wash. MECHANICAL MODELS FOR TUBULAR REACTOR FUEL ELEMENTS, by K. R. Merckx. Rept. on Contract AT(45-1)-1350. June 61, 37p.

HW-52347 $1.60

Hanford Atomic Products Operation, Richland, Wash. PRPR GAMMA RAY AND NEUTRON HEAT GENERATION CALCULATIONS, by J. R. Triplett. Rept. on Contract AT(45-1)-1350. Oct 57, 21p.

HW-67400 $1.60

Hanford Atomic Products Operation, Richland, Wash. PUREX. TRANSFER MEASUREMENT REVIEW, by W. H. Johnson. Rept. on Contract AT(45-1)-1350. Nov 60, 12p.

HW-70049 $3.50

Hanford Atomic Products Operation, Richland, Wash. THE RBU REACTOR-BURNUP CODE: FORMULATION AND OPERATING PROCEDURES, by J. R. Triplett, E. T. Merrill, and J. R. Burr. Rept. on Contract AT(45-1)-1350. July 61, 190p.

HW-67169 $1.10

Hanford Atomic Products Operation, Richland, Wash. TEST OF D REACTOR NOZZLES MODIFIED FOR BUMPER ELEMENTS, by J. D. Maguire. 21 Oct 60, 8p.

AD-263 636 $7.60 Not announced by ASTIA

Institute of Aerophysics, U. of Toronto (Canada). ANALYSIS OF BOILER ROOM PRESSURES FOLLOWING A POTENTIAL RUPTURE OF THE MAIN COOLANT LINE IN A NUCLEAR POWER PLANT, by I. J. Billington (Dilworth, Secord, Meagher and Associates, Ltd.) and I. I. Glass. Aug 60, 71p. 20 refs. UTIA rept. no. 70.

DESCRIPTORS: *Nuclear power plants, Boilers, Pressure, *Coolants, *Pipes, *Rupture, Thermodynamics, Heat transfer, Entropy, Enthalpy, Diaphragms (Mechanics).

An analysis was made of the maximum pressure rise and relevant pressure history that might occur in the boiler room of a nuclear reactor from the complete failure of a main, sixteen-inch, heavy-water, coolant pipe. The boiler room and the 9 ft. x 12 ft. x 50 ft. pressure relief duct were represented by a simplified mathematical model based on one-dimensional, inviscid flow in order to study the transient pressure rise following the failure, and a step-by-step numerical calculation provided the solution. The analysis included the effect of a sealing diaphragm at the upstream end of the pressure relief duct which was assumed to disintegrate within 10 milliseconds after the boiler room pressure reached 1.5 psig. The pressure-time history determined from this analysis shows a rapid rate of pressure rise from the instant of failure levelling off to a peak of 4.4 psig after approximately 0.3 seconds. The analysis is of general interest in the field of nuclear reactor safety and represents an interesting application of nonstationary-flow theory. The method may also prove useful in other industrial applications and may be of some assistance in the development of safety criteria for future nuclear power plants. (Author)

TID-14156 $1.60

Knolls Atomic Power Lab., Schenectady, N. Y. X-RAY ABSORPTION MEASUREMENT OF STEAM VOIDS IN WATER AT HIGH PRESSURES, by G. E. Martin and E. W. Grohse. Rept. on Contract W-31-109-eng-52. Nov 61, 16p. 6 refs.

NYO-2856 $2.75

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
MODEL TEST FOR STRESSES AND DEFLECTIONS IN THE N.S. SAVANNAH REACTOR VESSEL MODEL AND ATTACHMENTS, by R. E. Vining, Jr. Rept. on Contract AT(30-1)-2129. Dec 61, 175p.

UCRL-6636 $1.00

Lawrence Radiation Lab., U. of California, Livermore.
NUCLEAR EXPLOSIVES IN MINING, by William G. Flangas and David D. Rabb. Rept. on Contract W-7405-eng-48. Sep 61, 42p.

UCRL-6605 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
PROJECT SCOOTER: CLOSE-IN PRESSURE AND SHOCK ARRIVAL TIME MEASUREMENTS, by Jack N. Shearer, Robert G. Olson, and Otto H. Krause. Final rept. on Contract W-7405-eng-48. Sep 61, 30p.

LAMS-2650 $0.50

Los Alamos Scientific Lab., N. Mex.
ULTRA HIGH TEMPERATURE REACTOR EXPERIMENT (UHTREX). Quarterly status rept. for period ending 20 Nov 61, on Contract W-7405-eng-36. Jan 62, 18p.

MND-C-2207 $10.10

Martin Co., Baltimore, Md.
ANPP CODE DEVELOPMENT PROGRAM PRESSURIZED WATER TASK, by T. M. Olsen and L. Welshans. Quarterly progress rept. no. 8, 1 May-31 July 61, on Contract AT(30-1)-2431. Aug 61, 129p. 38 refs.

MND-P-3015-III $6.60

Martin Co., Baltimore, Md.
FUEL TECHNOLOGY DEVELOPMENT PROGRAM. Quarterly progress rept. no. 7, 1 Apr-30 June 61, on Contract AT(30-3)-217. 67p. 6 refs.

MND-MD-2539 $2.50

Martin Co., Baltimore, Md.
PM DEVELOPMENT: TASK 5.0 LOCAL BOILING HEAT TRANSFER TESTS. SINGLE TUBE HEAT TRANSFER AND PRESSURE DROP TESTS, by J. J. Jicha, Jr. and S. Frank. Rept. on Contract AT(30-1)-2706 July 61, 145p.

MND-MD-2560-2 $10.10

Martin Co., Baltimore, Md.
PM RESEARCH AND DEVELOPMENT PROGRAM. Quarterly progress rept. no. 2, 1 July-30 Sep 61, on Contract AT(30-1)-2706. 120p.

MND-P-3014-I $7.60

Martin Co., Baltimore, Md.
SNAP RADIOISOTOPE SPACE PROGRAMS. Quarterly progress rept. no. 6, 1 Jan-31 Mar 61, on Task 7, Contract AT(30-1)-217. 69p.

MND-P-3015-I $4.60

Martin Co., Baltimore, Md.
SNAP RADIOISOTOPE SPACE PROGRAMS. Quarterly progress rept. no. 7, 1 Apr-30 June 61, on Task 7, Contract AT(30-3)-217. 44p. 11 refs.

MND-P-2483-2 $10.50

Martin Co., Baltimore, Md.
STRONTIUM-90 FUELED THERMOELECTRIC GENERATOR DEVELOPMENT. Quarterly progress rept. no. 2, 1 Feb-30 Apr 61, on Task 8, Contract AT(30-3)-217. 125p.

MND-P-2483-3 $4.60

Martin Co., Baltimore, Md.
STRONTIUM-90 FUELED THERMOELECTRIC GENERATOR DEVELOPMENT. Quarterly progress rept. no. 3, 1 May-31 July 61, on Task 8, Contract AT(30-3)-217. 43p.

MLM-1116 $1.60

Mound Lab., Miamisburg, Ohio.
MOUND LABORATORY MONTHLY PROGRESS REPORT FOR JUNE 1961, by J. F. Eichelberger. Rept. on Contract AT(33-1)-GEN-53. Sep 61, 17p.

MLM-1117 $1.60

Mound Lab., Miamisburg, Ohio.
MOUND LABORATORY MONTHLY PROGRESS REPORT FOR JULY 1961, by J. F. Eichelberger. Rept. on Contract AT(33-1)-GEN-53. Nov 61, 12p.

ORO-493 $1.10

National Carbon Co., Fostoria, Ohio.
FUEL CYCLE DEVELOPMENT PROGRAM. Monthly newsletter, July 61, on Contract AT (40-1)-2560. Aug 61, 11p.

ORO-494 $1.10

National Carbon Co., Fostoria, Ohio.
FUEL CYCLE DEVELOPMENT PROGRAM. Monthly newsletter, Aug 61, on Contract AT(40-1)-2560. Sep 61, 8p.

NLCO-800 $9.60

National Lead Co. of Ohio, Cincinnati.
SUMMARY TECHNICAL REPORT, ed. by John W. Simmons. Rept. 1 Oct-31 Dec 59, on Contract AT(30-1)-1156. Jan 60, declassified 28 Nov 61. 127p.

NUMEC-P-60 $3.60

Nuclear Materials and Equipment Corp., Apollo, Pa.
DEVELOPMENT OF PLUTONIUM BEARING FUEL MATERIALS. Progress rept. 1 Jan-31 Mar 61, on Contract AT(30-1)-22389. Dec 61, 38p.

NUMEC-P-80 $5.60

Nuclear Materials and Equipment Corp., Apollo, Pa.
DEVELOPMENT OF PLUTONIUM BEARING FUEL MATERIALS. Progress rept. 1 July-30 Sep 61, on Contract AT(30-1)-2389. Nov 61, 56p.

NMI-ABB-1 $9.60

Nuclear Metals, Inc., Concord, Mass.
PROCESS SEQUENCE FOR THE FABRICATION OF HWCTR DRIVER TUBES, by A. B. Bremer, E. F. Jordan, and W. Macdonald. Rept. on Contract AT(30-1)-1565. Sep 60, 122p.

ORNL-3165 $1.25

Oak Ridge National Lab., Tenn.
DEVELOPMENT OF RING-JOINT FLANGES FOR USE IN THE HRE-2, by J. N. Robinson, M. I. Lundin, and I. Spiewak. Rept. on Contract W-7405-eng-26. 51p.,53 refs.

ORNL-TM-68 $4.60

Oak Ridge National Lab., Tenn.
AN EVALUATION OF A DEUTERIUM-MODERATED GAS-COOLED BREEDER REACTOR, by J. W. Miller. Dec 61, 48p. 11 refs.

ORNL-3157 $3.50

Oak Ridge National Lab., Tenn.
EXPERIMENTAL STRESS ANALYSIS OF EGCR PRESSURE VESSEL. PART I. EXPERIMENTAL DETERMINATION OF STRESSES IN MODEL. PART 2. INTERPRETATION OF EXPERIMENTAL RESULTS AND EXAMINATION FOR STRUCTURAL INTEGRITY, by R. W. Holland, R. L. Maxwell and others. Rept. on Contract W-7405-eng-26. [1961] 274p.

ORNL-3175 $1.75

Oak Ridge National Lab., Tenn.
LARGE-SCALE SLURRY-CIRCULATION SYSTEM (300-SM), by L. F. Parsly, Jr., H. L. Falkenberry and others. Rept. on Contract W-7405-eng-26. [1961] 70p. 30 refs.

ORNL-3218 $0.75

Oak Ridge National Lab., Tenn.
POSTIRRADIATION EXAMINATION OF 17-4 PH STAINLESS STEEL CONTROL ROD DRIVE RACK FROM SM-1 REACTOR, K. K. Klindt, A. E. Richt, and W. C. Thurber. Rept. on Contract W-7405-eng-26. [1961] 26p.

ORNL-TM-26 $8.60

Oak Ridge National Lab., Tenn.
A SIMULATION OF THE EGCR STEAM GENERATOR, by M. M. Yarosh and S. J. Ball. Oct 61, 78p.

ORNL-TM-32 $1.60

Oak Ridge National Lab., Tenn.
UNIT OPERATIONS SECTION. Monthly progress rept. Apr 61. Nov 61, 44p.

NYO-2687 $2.60

Olin Mathieson Chemical Corp., New Haven, Conn.
NUCLEAR FUEL RESEARCH FUEL CYCLE DEVELOPMENT PROGRAM. Quarterly progress rept. 1 Jan-31 Mar 60, on Contract AT(30-1)-2374. Apr 60, 28p.

IDO-16646 $1.50

Phillips Petroleum Co., Idaho Falls.
THE DESIGN, INSTALLATION, AND TESTING OF THE GAS-COOLED REACTOR UO_2 IRRADIATION EXPERIMENT AT THE NRTS, by E. H. Porter. Rept. on Contract AT(10-1)-205. Sep 61, 71p. 11 refs.

IDO-16671 $1.60

Phillips Petroleum Co., Idaho Falls.
ETR SPRING LATCH CONTROL ROD, by L. J. Harrison. Jan 61, 11p.

IDO-16712 $0.75

Phillips Petroleum Co., Idaho Falls.
MTR SHIM ROD CALIBRATIONS, by A. W. Brown. Rept. on Contract AT(10-1)-205. Sep 61, 31p. 3 refs.

PRDC-TR-49 $1.60

Power Reactor Development Co., Detroit, Mich.
MONTHLY TECHNICAL REPORT, on Contract AT(11-1)-476. July 61, 12p.

PRDC-TR-50 $1.60

Power Reactor Development Co., Detroit, Mich.
MONTHLY TECHNICAL REPORT FOR AUGUST 1961. Rept. on Contract AT(11-1)-476. Nov 61, 13p.

SL-1857-6 $2.60

Sargent and Lundy, Chicago, Ill.
REACTOR CONTAINMENT DESIGN STUDY. Progress rept. 15 Aug-15 Oct 61, on subcontract to Armour Research Foundation, Contract AT(11-1)-938. Oct 61, 26p.

SRO-60 $1.60

Savannah River Operations Office, Ga.
HEAVY WATER POWER REACTOR PROGRAM. Monthly progress rept. Oct 61, 19p.

DP-644 $1.00

Savannah River Lab., Aiken, S. C.
NUCLEAR PARAMETERS OF MASSIVE URANIUM RODS IN D_2O, by F. E. Kinard. Rept. on Contract AT(07-2)-1. Nov 61, 42p. 13 refs.

DP-630 $0.50

Savannah River Lab., Aiken, S. C.
RESIDUAL STRESSES IN NATURAL URANIUM, by J. Walter Joseph, Jr. Rept. on Contract AT(07-2)-1. Oct 61, 16p.

NAA-SR-6302 $5.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
ALTERNATOR ANALYSIS, DESIGN AND DEVELOPMENT. Topical rept. no. 9 on the SNAP II Power Conversion System, Contract AT(11-1)-GEN-8. June 61, 54p. TRW ER-4472.

NAA-SR-6301 $7.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
MERCURY CONDENSING RESEARCH STUDIES. Topical rept. no. 8 on The SNAP II Power Conversion System, Contract AT(11-1)-GEN-8. May 61, 70p. TRW ER-4442.

NAA-SR-6300 $6.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
SODIUM PUMP DESIGN AND TESTING. Topical rept. no. 10 on The SNAP II Power Conversion System, Contract AT(11-1)-GEN-8. Aug 60, 60p. 6 refs. TRW ER-4106.

CVNA-72 $15.00

Westinghouse Electric Corp., Pittsburgh, Pa.
CAROLINAS VIRGINIA NUCLEAR POWER ASSOCIATES, INC. RESEARCH AND DEVELOPMENT PROGRAM. Quarterly progress rept. Oct-Dec 60. 225p.

Nuclear Reactions

ARF-1164-18 $1.60

Armour Research Foundation, Chicago, Ill.
RESEARCH STUDY ON NEUTRON INTERACTIONS IN MATTER AS RELATED TO IMAGE FORMATION, by H. V. Watts. Rept. on Contract AT(11-1)-578. Nov 61, 21p.

TID-14261 $1.60

Knolls Atomic Power Lab., Schenectady, N. Y.
A TECHNIQUE FOR MEASURING THE NEUTRON CAPTURES IN BORON AND URANIUM-235, by D. A. Gavin, D. J. Anthony and others. 18p.

UCRL-6525-T(Rev.) $1.10

Lawrence Radiation Lab., U. of California, Livermore.
REARRANGEMENT COLLISIONS BETWEEN MUTUALLY ORTHOGONAL STATES, by B. A. Lippmann. Rept. on Contract W-7405-eng-48. July 61, 5p.

PUC-1961-45 $9.10

Palmer Physical Lab., Princeton U., N. J.
PICKUP REACTIONS INDUCED BY PROTONS INCIDENT ON SELECTED LIGHT NUCLEI, by James C. Legg. Doctoral thesis. Rept. on Contract AT(30-1)-937. Sep 61, 75p. 36 refs.

Radioactivity

HASL-117 $3.50

Health and Safety Lab., Atomic Energy Commission, N. Y.
FALLOUT PROGRAM, by Edward P. Hardy, Jr., Joseph Rivera, and Robert Frankel. Quarterly summary rept. 1 Sep-1 Dec 61. 256p. 39 refs.

TID-14226 $3.60

Laboratories for Applied Sciences, U. of Chicago, Ill.
RADIOISOTOPES RESEARCH, DEVELOPMENT, AND RELATED ACTIVITIES. Quarterly progress rept. 15 June-15 Sep 61, on Contract AT(11-1)-712. Oct 61, 37p. LAS-SR-P161-32.

PB 159 458 $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
GAMMA RADIATIONS FROM A ROUGH INFINITE PLANE, by C. F. Ksanda, A. Moskin, and E. S. Shapiro. 18 Jan 56, 12p. 2 refs. Research and development technical rept. USNRDL-TR-108; AD-113 588

DESCRIPTORS: *Gamma rays, *Gamma emission, Mathematical analysis, Radioactivity, Intensity, Contamination, Surface area, Ground effect, Detectors, Buildings.

The gamma radiation above a uniformly contaminated ground area was related to the activity concentration on the ground by assuming that a uniform mixture of radioactivity is distributed through a top layer of ground surface whose effective thickness depends on the roughness. (AEC abstract)

TID-13849 $1.60

Oak Ridge National Lab., Tenn.
ENVIRONMENTAL LEVELS OF RADIOACTIVITY FOR THE OAK RIDGE AREA, comp. by H. H. Abee. Rept. for fourth quarter 1960. Mar 61, 14p.

ARF-1184-3 $2.60

Armour Research Foundation, Chicago, Ill.
MAGNETIC PROPERTIES OF INSULATORS, by Jordan J. Markham. Quarterly rept. no. 3, 15 Aug-15 Nov 61, on Contract AT(11-1)-578. Nov 61, 23p. 8 refs.

PB 156 083 $1.60

Cornell U., Ithaca, N. Y.
PHOTON ABSORPTION BY VALENCE ELECTRONS IN NICKEL AND COPPER, by D. H. Tomboulian. Technical rept. no. 2 on Grant DA-ORD-37. Apr 61, 15p. 7 refs. OOR rept. no. 2810:2; AD-253 992.

DESCRIPTORS: *Photons, *Absorption, Nickel, *Electrons, Copper, Valence.

An investigation dealing with the photon absorption by valence electrons in Aluminum was presented (Tech. Rept. 1). Measurements of similar nature covering the cases of nickel and copper are described. The experimental arrangement and the general techniques used in the case of these metals was similar to those employed in the study of Aluminum. The dispersing instrument was a normal incidence vacuum spectrograph which was adjusted to operate in spectral region extending from 200 A to 900 A. The source of radiation was a condensed spark discharge in argon. Intensity comparisons were made by the use of a special photographic emulsion. While the Al absorbers were prepared within the spectrograph, the higher temperatures required for the evaporation of Ni and Cu resulted in frequent fracturing of the Formvar substrate. To provide additional support for the substrate, the absorbers were made in an auxiliary evaporation chamber with the substrate supported by a glass slide. The deposited layer was then removed from the slide and transferred to the spectrograph. Actual tests involving the M absorption spectra of Cu and the 3d transition metals (except Mn) indicate that a short exposure to air does not lead to observable changes which might arise from surface contamination. (Author)

PB 158 123 $8.10

General Mills, Inc., Minneapolis, Minn.
SPUTTERING YIELDS, by G. K. Wehner. Annual rept. 1 June 59-31 Oct 60, on Contract Nonr-1589(15). 15 Nov 60, 83p. 45 refs. Rept. no. 2136; AD-248 900.

DESCRIPTORS: *Ion bombardment, *Argon, Metallic compounds, *Plasma physics, *Xenon, Metal films, Semiconductors, Erosion, Mercury, Metals

Included in the report are:
Influence of the angle of incidence on sputtering yields, pub. in the Jnl. of Applied Physics 30:1762-1765, Nov 59
Angular distribution of sputtered material, pub. in the Jnl. of Applied Physics 31:177-179, Jan 60
Velocities of sputtered atoms, pub. in The Physical Review 114:1270-1272, 1 June 59
Forces on ion-bombardment electrodes in a low-pressure plasma, pub. in the Jnl. of Applied Physics 31:1392-1397, Aug 60
Sputtering thresholds and displacement energies, pub. in the Physical Review Letters 4:409-410, 15 Apr 60

TID-14257 $7.60

General Mills Electronics Group, Minneapolis, Minn.
SURFACE BOMBARDMENT STUDIES, by G. K. Wehner, G. S. Anderson, and C. E. KenKnight. Progress rept. 15 Feb-15 Nov 61, on Contract AT(11-1)-722. Nov 61, 79p. 24 refs.

UCRL-9865 $1.75

Lawrence Radiation Lab., U. of California, Berkeley,
ELECTRON DRIFT, DIFFUSION, AND IONIZATION MEASUREMENTS IN HYDROGEN WITH CROSSED ELECTRIC AND STRONG MAGNETIC FIELDS, by Melvin J. Bernstein. Rept. on Contract W-7405-eng-48. Oct 61, 72p. 35 refs.

LA-2618 $1.50

Los Alamos Scientific Lab., N. Mex.
LAGRANGIAN HYDRODYNAMIC COMPUTATIONS AND MOLECULAR MODELS OF MATTER, by Garrett Birkhoff and Robert E. Lynch. Rept. on Contract W-7405-eng-36. Dec 61, 58p. 26 refs.

PB 159 135 $3.60

Massachusetts U., Amherst.
AN OPTICAL DIFFRACTOMETER ANALYSIS OF LIGHT SCATTERING PATTERNS OBTAINED FROM POLYETHYLENE, by Philip R. Wilson, Samuel Krimm (U. of Michigan) and Richard S. Stein. ONR Technical rept. no. 28 on Contract Nonr-2151(00). 6 Feb 61, 35p. 10 refs. AD-252 215.

DESCRIPTORS: Films, *Thin films, Crystals, *Lattices, Structures, *Ethylenes, Polymers, *Diffraction, Optics, Light, Scattering, Microstructure, Polarization.

The optical-diffraction technique is used to analyze the interpretations of light scattering patterns from polyethylene films. Three cases are considered; (1) the effect of periodicity in spherulite structure, (2) the effect of spherulite anisotropy, and (3) the effect of internal structure. (Author)

PB 158 109 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
THE GELFAND-LEVITAN EQUATION FOR THE THREE-DIMENSIONAL SCATTERING PROBLEM, by I. Kay (Institute of Mathematical Sciences, New York U.) and H. E. Moses. Technical rept. no. 1, on Contract Nonr-839(30) and National Science Foundation NSF G-14,000. 15 Nov 60, 25p. 4 refs. AD-253 979.

DESCRIPTORS: *Scattering, *Potential scattering, Potential theory, Operators (Mathematics), Integrals.

A Gelfand-Levitan equation is introduced which enables one to calculate scattering potentials from part

of the scattering amplitude in the three-dimensional scattering problem. The part of the scattering amplitude which is required is an analogue of the reflection coefficient in one dimension. The potential which is obtained is more general than that usually assumed in the three-dimensional scattering problem in that it is diagonal in the radius variable but is a real integral operator in terms of the angular variables. The purely local potential (the potential which is diagonal in both the radial and angular variables) appears as a special case. It is assumed that the perturbed Hamiltonian has a purely continuous spectrum which coincides with that of the unperturbed Hamiltonian. The case where there are also point eigenvalues is omitted for simplicity. (Author)

PB 159 243 $5.60

Stanford Research Inst., Menlo Park, Calif.
RESULTS FROM EXPERIMENTAL RELAY NEURISTOR LINES, by H. D. Crane and A. Rosengreen. Interim rept. no. 2 on Contracts Nonr-3212(00) and AF 33(616)7567. Jan 61, 60p. 8 refs. SRI Proj. 3286; AD-250 826.

DESCRIPTORS: *Electrical networks, Signals, Neuromuscular transmission, Simulation, Propagation, Electric relays, Circuits, Nerves.

A better understanding of the performance of neuristor lines was sought and an attempt was made to verify various predictions regarding certain configurations of neuristor lines. Relatively simple lines based on relays were used, and two different types are discussed. Also considered is the performance of these lines when they are: (1) made to exhibit certain types of discontinuity along their length; (2) connected into specific T-junction, R-junction, and T-R junction configurations; and (3) connected into storagering configurations. Of particular interest is that certain effects were uncovered, some of which are pertinent to neuristor lines in general. These effects are referred to as: (1) pulse destruction by rear-end collision with a pulse ahead; (2) pulse-locking, in which a pulse takes up one of a set of stable positions behind a pulse ahead; and (3) pulse creation, which results from certain line dynamics (in this case a section of line that is periodically excited can resonate to the extent of creating pulses locally). (Author)

Acoustics

PB 159 389 $3.60

California Inst. of Tech., Pasadena.
UNIFORM DISTRIBUTIONS OF SOUND SOURCES ON THE SURFACE OF A RIGID SPHERE AND SOME APPLICATIONS, by Robert Hickling. Rept. on Contract Nonr-220(28). Feb 61, 36p. 12 refs. Engineering Div. rept. no. 85-18; AD-254 774.

DESCRIPTORS: *Sound, *Acoustics, *Acoustic impedance, Propagation, Spheres, Mathematical analysis, Pressure, Theory, Sources.

A study is made of certain elementary source distributions on the surface of a rigid sphere for a fairly extensive range of frequencies. The elementary systems considered consist of a point source, uniformly vibrating caps and rings, and plane line sources. Results are given for typical cases of the far zone sound fields and acoustic impedances of caps and rings, and also for the far zone sound field of a particular plane line source. Combinations of the elementary rings and caps are examined with a view to producing desired directional patterns and the results for a particular directional beam are presented. Taking a sphere as a model for the human head, the results for a point source are used to examine possible mechanisms for the binaural localization of sources of sound. These results indicate that, due to non-linear variation of phase with frequency, a pulsed sound should appear in a somewhat different form at each ear. (Author)

PB 159 453 $3.60

Naval Ordnance Lab., White Oak, Md.
NORMAL INCIDENCE MEASUREMENT OF ACOUSTIC BOTTOM CONSTANTS, by C. B. Leslie. 1 Nov 60, 31p. 14 refs. NAVORD rept. 6832; AD-253 682.

DESCRIPTORS: *Underwater sound, Acoustics, *Underwater sound transmission, Determination, *Ocean bottom, Reflection, Velocity, Measurement, Density.

As part of a project on shallow water propagation, a theory was developed to permit a simple determination of the density and sound velocity of a liquid bottom by measurements of the normal incidence reflection coefficient. The measured results showed considerable deviations from the predicted results. With the aid of results from other phases of the shallow water work, explanations are given for most of the discrepancies. Evidence is presented to show that with a point source at low frequencies, the bottom acts like a solid with rigidity and does not act like a liquid. The effects of gas bubbles in the bottom are presented and discussed in detail; they cause the bottom to act like a pressure release surface and reduce the sound velocity in the bottom to an unusually low value. (Author)

Electricity and Magnetism

PB 159 377 $5.60

Electrical Engineering Research Lab., U. of Texas, Austin.
FURTHER STUDIES OF THE DIRECTIONAL PROPERTIES OF MAGNETOTELLURIC SIGNALS, by L. D. Provazek, H. W. Smith, and F. X. Bostick, Jr. Rept. on Contract Nonr-375(01). 20 Feb 61, 56p. 14 refs. Rept. no. 119; AD-252 440.

DESCRIPTORS: *Electric fields, *Magnetic fields, Magnetic recording systems, *Terrestrial magnetism, *Detection, Electromagnetic waves, Measurement, Earth, Band pass filters, Recording devices, Narrowband.

Preliminary measurements of the directional properties and phase relations of the magnetotelluric fields at Austin, Texas, were described in EERL Report No. 116. In this report, these measurements have been extended to include a large number of cases over the period from 13 April to 26 October 1960. In addition, the measurement of the direction of the vertical components and the total variable magnetic field have been included. (Author)

PB 156 879 $7.60

Laboratory for Electronics, Inc., Boston, Mass.
RESEARCH IN FERROMAGNETICS. Annual rept. 1 Sep 59-31 Aug 60, on Contract Nonr-2676(00). [1960] 78p. 10 refs. Rept. no. 570-A2; AD-254 144.

DESCRIPTORS: *Ferromagnetic materials, Ferromagnetism, Films, Metal films, Thin films, *Memory devices, Thickness, Measurement, Instrumentation, Hysteresis.

A means of controlling wall motion is reviewed; the results of previous experiments on controlled wall motion are re-examined, and a mechanism is proposed to explain the results. Some of the difficulties are described that occur in making measurements to determine the effects of transverse fields on film switching. The use of a 50/50 Ni-Fe alloy as a material for controlled wall motion experiments is shown to present certain complications beyond those experienced in using a 80/20 Ni-Fe alloy. Films of composition 80/20 Ni-Fe were investigated, and for these films and present techniques the limitations to be expected in storage density are determined. Film thickness measuring techniques are reviewed and compared. This work was directed toward producing films of reproducible thickness. A number of refinements are described that were made in the magneto-optic bench equipment and in the thickness-measuring interferometer. (Author)

Molecular Physics and Spectroscopy

PB 159 262 $3.60

Institute of Molecular Physics, U. of Maryland, College Park.
THE DETERMINATION OF ISENTROPIC PRESSURE-DENSITY CURVES FOR ARGON FROM A RAPID DYNAMIC PROCESS, by L. T. Ho, A. E. Seigel (Naval Ordnance Lab.) and others. Technical rept. no. 2 on Contract Nonr-595(02). 9 Jan 61, 33p. 16 refs. AD-250 204.

DESCRIPTORS: *Argon, Molecules, *Gases, Density, Determination, Pressure, Dynamics, Compressible flow, *Equations of state, Thermodynamics, Shock waves.

Isentropic pressure-density curves for argon were obtained from measurements on the rapid expansion of the gas behind a piston. Results are given for cases when the argon was initially at room temperature and at pressures of from 400 to 900 atmospheres. The agreement with equilibrium data is good.

PB 159 264 $1.10

Institute of Molecular Physics, U. of Maryland, College Park.
PRESSURE-DENSITY ISENTROPES FOR ARGON AT TEMPERATURES BETWEEN 150° C AND -140° C AND AT PRESSURE UP TO 1950 ATMOSPHERES, by L. T. Ho, A. E. Seigel (Naval Ordnance Lab.) and others. Technical rept. no. 3 on Contract Nonr-595(02) 13 Jan 61, 7p. 7 refs. AD-250 205.

DESCRIPTORS: *Argon, Pressure, Density, Numerical analysis, Experimental data, Temperature, *Gas flow, Pistons.

TID-14203 $2.60

Johns Hopkins U., Baltimore, Md.
THE ENERGY LEVELS OF HEXAGONAL $ErCl_3$, by F. Varsanyi and G. H. Dieke. Rept. on Contract AT940-1)-1447. Nov 61, 30p. 10 refs.

UCRL-9873 $2.00

Lawrence Radiation Lab., U. of California, Berkeley,
ELECTRON SPIN RESONANCE LINE WIDTHS OF TRANSITION METAL IONS AND COMPLEXES IN SOLUTION, by Robert G. Hayes. Rept. on Contract W-7405-eng-48. Sep 61, 93p. 33 refs.

LAMS-2649 $0.50

Los Alamos Scientific Lab., N. Mex.
ENERGY LEVELS IN CESIUM, by Bob E. Watt. Rept. on Contract W-7405-eng-36. Jan 62, 10p. 2 refs.

Solid State Physics

PB 159 302 $3.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
THEOREMS IN LINEAR ELASTOSTATICS FOR EXTERIOR DOMAINS, by M. E. Gurtin and Eli Sternberg. Technical rept. no. 11 on Contract Nonr-562(25). Jan 61, 39p. 16 refs. AD-252 145.

DESCRIPTORS: *Elasticity, Mechanics, Stresses, Mathematical analysis, *Functions, Potential theory.

Conventional proofs of fundamental theorems in three-dimensional classical elastostatics such as the traditional proofs of the uniqueness and reciprocal theorems or of the minimum energy principles are generalized to unbounded domains exterior to a finite number of closed surfaces.

TID-14231 $3.60

Case Inst. of Tech. Cleveland, Ohio.
STRESS ANNEALING IN THIN IRON FILMS, by J. D. Finegan and R. W. Hoffman. Rept. on Contract AT(11-1)-623. Aug 61, 27p. 10 refs.

TID-14230 $3.60

Case Inst. of Tech., Cleveland, Ohio.
THEORY OF THERMAL EXPANSION AT LOW TEMPERATURE, by Raymond D. Mountain. Technical rept. no. 16 on Contract AT(11-1)-623. May 61, 32p. 36 refs.

PB 158 670 $1.10

Institute of Tech., U. of Minnesota, Minneapolis.
X-RAY STUDY OF AGED AU-NI ALLOYS, by J. M. Sivertsen and R. C. Sundahl Technical rept. no. 1, on Contract Nonr-710(29). 15 Dec 60, 10p. 7 refs; AD-250 502.

DESCRIPTORS: *Gold alloys, Nickel alloys, *X-ray diffraction analysis, Aging, Hardening, Phase studies, Lattices, Microstructure.

An investigation was made of the age-hardening process of Au-Ni alloys below 225 degrees C. Previous data indicate that aging below 225 C might involve clustering of atoms. These clusters may consist of groups of like atoms (either Au or Ni) or, structurally, regions of higher geometric order. Measurements were made of the relative shifts of the X-ray diffraction peaks during aging. The 0.03 x 1 x 0.75 in. specimens has a 36 at-% Ni and 64 at-% Au composition. The measured value of the relative shifts of the (200)-(111) line separation amounted to -0.07 degrees, while the measured value for the (400)-(222) line separation was +0.05 degrees. These relative line shifts suggested the formation of stacking faults during aging treatment. Results suggest that the quenched-in vacancies migrate and coagulate during aging to form platelets on one or the other of the close-packed planes of the lattice. Collapse of the platelets results in the formation of tetrahedral stacking faults where Ni atoms might aggregate from chemical enteraction between solute atoms and stacking faults.

PB 158 089 $4.60

Kansas U., Lawrence.
INFLUENCE OF MAGNETIC INTERACTION ON THE NUCLEAR ORIENTATION OF COBALT-60 IN RARE EARTH DOUBLE NITRATES, by M. W. Levi, R. C. Sapp, and J. W. Culvahouse. Technical rept. no. 1 on Contract Nonr-2775(00). 1 Nov 60, 43p. 36 refs. AD-246 998.

DESCRIPTORS: Cobalt, *Rare earth compounds, Cerium compounds, *Nitrates, Spin, *Ions, Single crystals, Magnetic fields, Paramagnetic crystals, *Cobalt compounds, Magnetic properties

The effect of ionic spin-spin interactions on nuclear orientation of Cobalt-60 in cerous zinc nitrate was investigated in single crystal spherical samples cooled below 1° K by adiabatic demagnetization. An experimental demonstration is given that Cerium-Cobalt interaction is indeed the cause of the apparently anomalous alignment data. By hypothesizing the existence of a temperature-dependent internal magnetic field, exerted on cobalt ions by spatially ordered cerium dipoles below the critical temperature, a simple but quantitatively satisfying description of the observed phenomena is obtained in the molecular field approximation with $T = 6.9 \pm .1^{\circ}$. K and $H = 165 \pm 20$ oersteds. The nature of the ordered state could not be inferred in detail, however. In the theoretical calculations, measured values of g-factors and hfs splittings of cobalt ions in the cerium salt are used where appropriate. Crystal structure information is invoked only for the purpose of a symmetry argument. Finally, the effectiveness of Cerium-Zinc nitrate as a paramagnetic medium for nuclear orientation experiments is pointed out. (Author)

PB 158 090 $4.60

Kansas U., Lawrence.
MAGNETIC INTERACTIONS OF CERIUM AND COBALT IONS IN DOUBLE NITRATE CRYSTALS, by J. W. Culvahouse, W. Unruh, and R. C. Sapp. Technical rept. no. 2 on Contract Nonr-2775(00). 1 Nov 60, 42p. 19 refs. AD-246 999.

DESCRIPTORS: *Crystals, *Ions, *Cerium compounds, *Cobalt compounds, *Nitrates, *Paramagnetic resonance, Cobalt, Magnetic effects

The space group of the double nitrate crystals $M'_2M''_3(NO_3)_{12} \cdot 24H_2O$ where M' is a trivalent cation and M'' is a divalent cation was determined from X-ray data to be $R\bar{3}m$. The rhombohedral unit cell has sides of 13.9 A, interaxial angles of 49° and contains one molecule. The cerium ions have the location $\pm$ (1/4, 1/4, 1/4). The line shapes of the derivative of paramagnetic resonance absorption of small concentrations of cobaltous ions substituted in $Ce_2Zn_3(NO_3)_{12} \cdot 24H_2O$ are described and used to determine the spatial relations of the cerium ions and cobalt ions, as well as to justify the assumption of a dipolar interaction between them described by the spin Hamiltonian parameters of the cerium and cobalt ions. The more isotropic of the two paramagnetic spectra of cobalt ions observed in this salt is due to ions in either the special sites $\pm$(0.399, 0.399, 0.399) or, rather less likely, in the special sites $\pm$(0.101, 0.101, 0.101) and the highly anisotropic spectra of cobalt ions is due to ions in the body centered site. (Author)

PB 158 059 $2.60

Materials Research Corp., Yonkers, N. Y.
RECOVERY OF FLOW STRESS IN DEFORMED SINGLE CRYSTALS OF LITHIUM FLUORIDE, by E. S. Machlin. Technical rept. no. 3 on Contract Nonr-2432. 30 Nov 60, 21p. 11 refs. NRC no. R197; AD-250 456.

DESCRIPTORS: *Single crystals, Recovery, *Stresses, Lithium compounds, Fluorides, Measurement, Temperature, Mechanical properties.

The time and temperature dependence of the flow stress in LiF single crystals was measured. A two stage recovery was found. The low temperature recovery obeyed an activation energy of 5250 plus or minus 700 cal/mol. The high temperature recovery followed an activation energy of 43,500 plus or minus 6000 cal/mol. Based on observation of the presence or lack of motion of dislocations during recovery a theory for the recovery process is suggested. The rate determining step for low temperature recovery is suggested to be the glide of nonconservative jogs along screw dislocations; that for high temperature recovery is dislocation climb and the annihilation of jogs along edge dislocations. (Author)

PB 156 435 $1.10

Michigan State U., East Lansing.
PARAMAGNETIC RELAXATION AT VERY LOW TEMPERATURES, by R. D. Spence, Z. M. El Saffer, and J. A. Cowen. Technical operating rept. no. 7 on Contract AF 49(638)613. Dec 60, 3p.

DESCRIPTORS: Alkali metal compounds, Lithium compounds, Copper, Chlorides, Water, *Relaxation time, Polarization, Temperature, Benzenes, Cyclohexanes, *Nuclear magnetic resonance, *Paramagnetic resonance, Resonance, *Cryogenics, *Paramagnetic crystals

A brief report is given on dynamic polarization, relaxation time studies of Li $CuCl_3 \cdot 2H_2O$, and NMR in hexamethylbenzene.

PB 156 064 $3.60

Pennsylvania State U. [University Park].
THE SOURCE-WAVE FOR A CONCENTRATED LOAD AT A PLANE BOUNDARY. PART II, by Norman Davids. Interim technical rept. no. 21 on Research and Development and Theoretical Analysis of Scabbing in Materials, Contract DA-ORD-31-124-61-G16. 15 Mar 61, 37p. 8 refs. OOR no. 1253:22; AD-254 617.

DESCRIPTORS: *Stresses, Wave analysis, Load distribution, Sheets, *Wave transmission

The general solution to the equations of stress waves as given in spherical coordinates is classified, by means of a parameter n appearing in this solution, into waves of positive and negative integer orders. The expressions for the displacements and stresses are given for orders zero, one, and minus one, and the results applied to a study of the stresses developed in a hemispherically-shaped region very close to a point of concentrated impact on a plane surface of a solid or plate. The wave of order minus one is a singular wave developed for the purpose of making the boundary stresses vanish at the source. The Laplace inversion into the time domain is obtained in general, and the resulting normal stress distribution along the axis is compared with previous work by other methods. The progress towards an exact solution to the boundary-value problem is outlined. (Author)

AD-265 545 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
PLANE-STRAIN BENDING OF SANDWICH PLATES, by John E. Koch. Technical note no. 11 on Contract AF 49(638)453. May 61, 28p. 4 refs. AFOSR 837.

DESCRIPTORS: *Sandwich panels, *Deformation, Load distribution, Stresses, Elasticity, Mathematical analysis, Series, Integration

The plane-strain bending of a symetrically arranged three-layered plate is studied on the basis of a recent flexural theory. Solutions are found for three common types of support under arbitrary transverse surface loading conditions. On the basis of these solutions, the importance of the various effects included in the theory is assessed. (Author)

PB 181 114 $1.25

Research Chemicals, Inc., Burbank, Calif.
INVESTIGATION OF THE APPLICATION OF ELECTRIC CURRENT DURING ZONE REFINING, by Louis L. Thomas. Rept. for Dec 59-Nov 60 on Applied Research in Electrical, Electronic and Magnetic Materials, Contract AF 33(616)6150. July 61, 49p. 3 refs. WADD Technical rept. 61-90.

DESCRIPTORS: *Zone melting, Melting, *Electric currents, Electrical effects, *Germanium, Semiconductors, Resistance, Tests, Impurities.

An investigation of the effects of axial direct current during a zone refining process has been continued. Optimum current direction and limiting current densities have been established. Results for germanium indicate that the segregation rate is increased when the current flows opposite to the direction of zone travel, and is decreased when the current is reversed. The magnitude of the effect is larger than the theoretical rate of diffusion of ions in an electric field, and the optimum current direction is opposite to that predicted from considerations of interface stability due to the Peltier effect. (Author)

PB 159 362 $9.10

Stanford Electronics Labs., Stanford U., Calif.
AN INVESTIGATION OF SURFACE STATES AT A SILICON/SILICON-OXIDE INTERFACE EMPLOYING M-O-S DIODES, by L. M. Terman. Rept. on Contract Nonr-225(24). 23 Feb 61, 106p. 11 refs. Technical rept. no. 1655-1; AD-253 926.

DESCRIPTORS: *Semiconductors, *Surfaces, *Semiconducting films, Silicon, Crystals, Diodes, Oxides Electrostatic capacitance, Density, Voltage, Surface properties

An investigation was made of the densities and time constants of surface states at a silicon/silicon-oxide interface. The tool used for this investigation was the M-O-S diode, a new solid-state device which, besides being useful for fundamental research of the type presented, also offers at least some potential as a circuit device due to its highly voltage-sensitive capacitance. Since an understanding of the M-O-S diode is essential, a general picture is given of its mode of operation and characteristics. The description given of the operation of the device is intuitive rather than mathematical, to enable the reader to obtain a physical "feel" for its operation. A comparison of the capacitance-vs-voltage curves of an idealized M-O-S diode and p-n step junction is presented, and reasons are given for the more rapid change of capacitance with voltage in the M-O-S diode. The effect of the possible existence of surface states at the silicon/silicon-oxide interface is discussed. (Author)

PB 181 096 $6.00

Utah U., Salt Lake City.
A SURVEY OF HIGH PRESSURE EFFECTS OF SOLIDS, by K. L. DeVries, G. S. Baker, and P. Gibbs. Rept. for Jan 57-May 59 on Interactions, Imperfections, and Alloy Theory, Contract AF 33(616)5016. Oct 60, 487p. 258 refs. WADC Technical rept. 59-341; AD-247 247.

DESCRIPTORS: *High pressure research, *Solids, Bibliography, Pressure, *Metals, Stresses, Test equipment, Tensile properties, Physical properties, Internal friction, Plastic flow, Mechanical properties.

This report contains a summary of all "known" high pressure work done on solids since 1947, with selected reference to work on liquids and gases. The data is presented in the form of 40 tables and more than 500

figures. Some 250 references have been summarized. Descriptions are given of apparatus procedure, and results. (Author)

PB 159 465 $11.00

Westinghouse Electric Corp., Bloomfield, N. J.
IMPROVED RED ELECTROLUMINESCENT PHOSPHORS, by H. F. Ivey, P. M. Jaffe and others. Rept. for June 60-May 61 on The Chemistry and Physics of Materials, Contract AF 33(616)7350. May 61, 141p. 80 refs. ASD Technical rept. 61-167.

DESCRIPTORS: *Phosphors, Colors, Luminescence, Electric fields, *Luminescent materials, Fluorescence, Phosphorescence, Preparation, Zinc compounds, Sulfides, Catalysts, Catalysis.

A large number of materials of potential interest as red-emitting electroluminescent phosphors have been studied experimentally. A large number of elements were tried as possible luminescence activators in ZnS. The following new red emitters were investigated in some detail: ZnS:Cu, Tl, ZnS:Cu, Li, Ti, ZnS:Cu, Fe, I, and hexagonal (Zn, Cd) S:Cu, I. $ZnAl_2S_4$ was also shown to be of some interest as a new base material for phosphor preparation. The best red electroluminescent phosphor is still cubic (Zn, Cd, Hg)S:Cu. It has now been found possible to prepare these phosphors by conventional firing techniques at atmospheric pressure rather than the high-pressure method used previously. With improved techniques of lamp construction a brightness of 1.0 ft-L at 115 volts, 400 cps can be achieved with such a phosphor having "Aviation Red" color. The maintenance of output of red phosphors is a major problem; the best material shows only 50% of its initial output after about 15 hours of operation at 400 cps. (Author)

Theoretical Physics

TID-14078 $3.60

Laboratory for Nuclear Science, Inst. of Tech., Cambridge.
DIRECT OBSERVATIONS OF THE INTERPLANETARY PLASMA, by H. S. Bridge, C. Dilworth and others. Oct 61, 28p.

LAMS-2651 $0.50

Los Alamos Scientific Lab., N. Mex.
LASL CONTROLLED THERMONUCLEAR RESEARCH PROGRAM. Quarterly status rept. for period ending Nov 61, on Contract W-7405-eng-36. Jan 62, 14p.

TID-14077 $2.60

Stevens Inst. of Tech., Hoboken, N. J.
MAGNETICALLY CONFINED PLASMA WITH A MAXWELLIAN CORE, by George Schmidt and David Finkelstein (Yeshiva U., New York). Nov 61, 20p.

Thermodynamics

ANL-6465 $0.50

Argonne National Lab., Ill.
THERMIONIC ENERGY CONVERSION DIODE USING A FILM BOILING LIQUID METAL ANODE, by A. J. Ulrich. Progress rept. Feb-Sep 61, on Contract W-31-109-eng-38. Dec 61, 11p. 6 refs.

WAPD-T-1367 $8.10

Bettis Atomic Power Lab., Pittsburgh, Pa.
FUEL TEMPERATURE MEASUREMENT, by G. W. Hardigg and L. M. Swartz. Rept. on Contract AT(11-1)-GEN-14. July 61, 87p.

WAPD-AD-TH-545 $8.10

Bettis Atomic Power Lab., Pittsburgh, Pa.
HIGH ACCURACY THERMOCOUPLE MEASUREMENT TECHNIQUES, by E. W. Fink and T. W. Hunt. Rept. on Contract AT(11-1-GEN-14. Oct 59, 89p.

PB 156 080 $5.60

Illinois U., Urbana.
THERMAL CONDUCTIVITY OF LEAD AT LOW TEMPERATURE, by Charles L. Wolff. Technical rept. no. 1 on Experimental Research upon Superconducting Metals, Grant no. DA-ORD-18. Jan 61, 58p. 50 refs. OOR rept. no. 2771:2; AD-253 117.

DESCRIPTORS: *Superconductivity, *Lead, *Heat transfer, Mathematical analysis, Low temperature research, Resistance, Lattices, Temperature, Electrons, Conductivity, Phonons, Cryogenics.

Low temperature thermal conductivity measurements were made in the superconducting and normal states of Pb samples with impurities of less than 0.05 at-%. An isothermal relation was derived between the strength of point defect scattering and ratio, K sub s/K sub n, of the thermal conductivity in the two states. As long as only electron conductivity is important, K sub s/K sub n varies linearly with the square root of the ratio, r, of point defect scattering resistance to phonon scattering resistance in the normal state. An extrapolation to r equals 0 of this linear relation provides curves which are interpreted as the temperature dependence of K sub s/K sub n in perfectly pure Pb and Hg. The thermal magneto-resistance of Pb was measured in longitudinal field; the longitudinal and transverse resistance appear to approach each other above 4 K in Pb, while below this temperature their behaviors are radically different. (Author)

KAPL-2170 $2.50

Knolls Atomic Power Lab., Schenectady, N. Y.
HYDRODYNAMIC STABILITY OF A BOILING CHANNEL, by Alan B. Jones. Rept. on Contract W-31-109-eng-52. Oct 61, 127p. 12 refs.

UCRL-9880 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
HEAT-CAPACITY STUDIES AT LIQUID HELIUM TEMPERATURES AND BELOW. PART I: THE ALKALI METALS. PART II: SMALL PARTICLES OF MAGNESIUM OXIDE, by William Henry Lien. Rept. on Contract W-7405-eng-48. Jan 62, 75p. 53 refs.

UCRL-9952 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
THE THERMODYNAMIC PROPERTIES OF THE ALKALI HALIDES, by Leo Brewer. Rept. on Contract W-7405-eng-48. Nov 61, 9p. 11 refs.

PB 159 290 $1.10

Massachusetts Inst. of Tech., Cambridge.
DEVELOPMENT OF FUNDAMENTAL EQUATIONS FOR VAPOR AND LIQUID WATER, by Joseph H. Keenan, Frederick G. Keyes, and John D. Bannister. Final rept. on Contract Nonr-1841(60). Jan 61, 10p. 6 refs. AD-253 800.

DESCRIPTORS: Vapors, Liquids, *Steam, Equations of state, Density, *Thermodynamics, Water vapor, Water.

TID-14259 $11.00

Michigan U., Ann Arbor.
CRYOGENIC THERMODYNAMIC STUDIES ON SOME GLOBULAR MOLECULES AND ON THE SYSTEM TETRAMETHYLAMMONIUM CHLORIDE-TETRAMETHYLAMMONIUM HYDROGEN DICHLORIDE, by Shu-Sing Chang. Doctoral thesis. 1961, 42p.

Wave Propagation

PB 158 075 $4.60

Electrical Engineering Research Lab., U. of Texas, Austin.
RADIATION FROM A CURRENT FILAMENT ABOVE A HOMOGENEOUS EARTH WITH APPLICATION TO MICROPULSATIONS, by P. F. Law and B. M. Fannin. Rept. on Contract Nonr-375(01). 1 Nov 60, 49p. 22 refs. Rept. no. 118; AD-246 529.

DESCRIPTORS: Electric fields, Magnetic fields, *Terrestrial magnetism, Solar energy, Radio interference, Ionosphere, Earth, Impedance, *Wave transmission, Magnetic storms, Electromagnetic waves, *Propagation, *Electric currents.

A solution is given for the electric and magnetic fields associated with a horizontal line current source above a plane, homogeneous earth. The near field considerations are of primary importance and care was taken not to include approximations that would mask their effects. Solutions are given in terms of Hankel, Bessel, and Struve functions. The fields at the earth's surface are evaluated for a particular set of parameter values. These parameters are chosen to approximate an ionospheric radiating source at a typical micropulsation frequency. Results indicate that near field considerations give rise to an appreciable vertical component of magnetic field variation at the earth's surface. The downward wave impedance of the homogeneous earth remains substantially that value predicted by a plane wave incidence approach. (Author)

PB 157 530 $2.60

Electrical Engineering Research Lab., U. of Texas, Austin.
A STUDY AND ANALYSIS OF ANOMALOUS ATMOSPHERIC WATER VAPOR ABSORPTION OF MILLIMETER WAVELENGTH RADIATION, by C. W. Tolbert, A. W. Straiton, and J. R. Gerhardt. Rept. on Contract Nonr-375(01). 31 Oct 60, 27p. 20 refs. Rept. no. 117; AD-246 528.

DESCRIPTORS: *Atmosphere, *Water vapor, *Absorption, Gases, Measurement, Wave transmission, *Attenuation, Superhigh frequency, Radiometers, Spectrographic analysis.

Water vapor attenuation measurements in the 18 to 140 kMc frequency band are reviewed and compared with those based on spectroscopic observations of pure gases. Results show that propagation type measurements in the free atmosphere gave rise to unexplained absorption anomalies from theoretically predicted values. These included (1) deviations in the windows of the water vapor absorption spectrum, (2) non-linearity effects, and (3) enhanced water vapor losses in presence of oxygen absorption lines. Qualitative hypotheses are offered for an explanation of these effects. (Author)

PB 158 006 $22.25

General Dynamics/Convair, San Diego, Calif.
OCEANOGRAPHIC TELEMETRY. METHODS FOR SYSTEMS EVALUATION, by Richard D. Baxter, Robert F. Devereux and others. Rept. on Contract Nonr-3062(00). 9 Nov 60, rev. 2 Feb 61, 410p. 118 refs. ZN-495; AD-250 280.

DESCRIPTORS: *Radio transmission, Noise (Radio), Telemeter systems, Oceanographic data, Test methods.

Contents:
Propagation of radio waves
The transmission equation
Basic choices in radio link design
Interpretation of results
Computation of directwave transmitter power (P)
Computation of groundwave transmitter power (P)
Computation of F2 skywave transmitter power (P)
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Antennas
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Need for on-location storage of data
Types of storage
Magnetic tape storage system characteristics
Methods of data storage

NYO-9761 $1.60

Institute of Mathematical Sciences, New York U., N. Y.
THE EFFECT OF FINITE CONDUCTIVITY ON THE PROPAGATION OF HYDROMAGNETIC SLOW WAVES, by Tosiya Taniuti. Rept. on Contract AT(30-1)-1480. Sep 61, 16p. MF-21.

PB 158 070 $4.60

John Carroll U., Cleveland, Ohio.
EXPERIMENTAL STUDY OF DIFFRACTION AND WAVEGUIDE EFFECTS IN ULTRASONIC ATTENUATION MEASUREMENTS, by E. F. Carome, J. M. Witting, and P. A. Fleury. Technical rept. no. 4 on Contract Nonr-2577(01). 30 Nov 60, 42p. 13 refs. AD-248 734.

DESCRIPTORS: *Ultrasonics, *Liquids, *Waveguides, Quartz crystals, Propagation, Diffraction, Ultrasonic properties, Sources, Measurement, Attenuation, Absorption.

An experimental study was made of the propagation of ultrasound in liquids under both free field and guided wave conditions. Free field measurements were made from 1 to 20 mc in low absorbing liquids, employing both circular and square sound sources. These measurements indicate that the correction for diffraction loss predicted by existing theories is applicable only so long as this loss is smaller than the true absorption. Attenuation measurements also were made in liquids confined in various cylindrical and rectangular metallic waveguides. For a given configuration, the observed variation with path length of the attenuation follows closely that predicted theoretically for propagation in a solid sample of the same dimensions. Some consideration is given to possible sources of this effect and to its importance in measurement of ultrasonic velocity. (Author)

PB 159 363 $6.60

Stanford Electronics Labs., Stanford U., Calif.
AN ANALYSIS OF A NONLINEAR TRANSMISSION LINE, by R. B. Riley. Rept. on Contract Nonr-225(31). 20 Jan 61, 65p. 11 refs. Technical rept. no. 1707-1; AD-250 908.

DESCRIPTORS: *Wave transmission, Propagation, *Transmission lines, Shock waves, Electric currents, Electromagnetic waves, Wave analysis.

Techniques are presented based on the method of characteristics and a study of electromagnetic shock waves, for calculating line voltage and current as functions of position and time, even in the presence of forward and backward traveling waves and shock waves. For a wave traveling in one direction, the technique is quite simple and the changes in the wave as it propagates are readily visualized. Such calculations are extremely difficult, if not impossible, using more conventional techniques for nonlinear lines which involve a truncated Taylor series and Fourier expansions. The results of the study of shock waves are included: shock velocity, voltage and current changes across a shock, energy loss, rise time and the detailed shape of certain shock waves. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 158 561 $3.60

Dunlap and Associates, Inc., Santa Monica, Calif.
INVESTIGATION OF ADDITIVE COLOR PHOTOGRAPHY AND PROJECTION FOR MILITARY PHOTO-INTERPRETATION. I. OPERATIONAL CONSIDERATIONS AND RESEARCH HYPOTHESES, by Richard P. Winterberg, Joseph W. Wulfeck, and Lionel Wheeler (Colorvision, Inc.). Technical rept. 1 on Contract Nonr-3137(00). Dec 60, 35p. 79 refs. AD-253 159.

DESCRIPTORS: *Military intelligence, *Color photography, Photographic intelligence, Processing, Reliability, Effectiveness.

The operational problem of military photo-interpretation was reviewed. An analysis of interpretation problems indicates that in order to enhance the military reconnaissance capability, new techniques must provide additional information and/or add to the speed, accuracy, and certainty of interpretation. The composite capability of an additive color photography and projection system for black and white, full color or selective spectrum viewing indicates that additive color photography may be of great potential value to photo-interpretation. Hypotheses generated in this analysis will be studied experimentally. Details of the additive color system to be used in the experimental study are described. (Author)

PB 157 533 $6.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. II: HOW SHOULD MATERIAL USAGE BE RECORDED, by J. E. Hamilton. Rept. on Logistics Research Project, Contract Nonr-761(05). 24 Oct 60, 66p. 4 refs. Serial T-121/60; AD-245 158.

DESCRIPTORS: *Research program administration, *Naval research, Naval logistics, Logistics, Data, Collecting methods.

The paper does not describe "experience" as a tabulation of factual occurrences. It describes a "distillation" from experience, that is: those reflections, ideas, questions, and problems which arose in the minds of those who received the experience. Its pertinence to the "experience" series rests on the positive opinion that there are problem areas which must be cleared up before the actual experience can be practicably related to the logistics field. The problem areas which have been discussed without offering full suggested corrections are: the need for a basic, universal, functional

(in a logistics sense) classifications of all naval (ship) materials; the need for a complete catalogue of installations of each ship on an absolutely current basis; the need for a current Allowance Parts List for every item in every ship's catalogue of installations; the need for stabilizing assignment of Federal Stock Numbers or of devising procedures to overcome the effect of the present high rate of change of stock numbers; and the need for practicable codes for every element in a record of a material use transaction. (Author) (See also PB 150 555)

PB 158 065 $6.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. III: THE DOCUMENTS COLLECTED BY THE LOGISTICS RESEARCH PROJECT, by J. E. Hamilton. Rept. on Logistics Research Project, Contract Nonr-761(05). 16 Nov 60, 65p. 6 refs. Serial T-125/60; AD-246 730.

DESCRIPTORS: Research program administration, *Naval logistics, Naval research, *Logistics, Data, Collecting methods, Naval supplies, *Reports, *Records, *Military publications, Naval shore establishments, Naval vessels, Shipyards.

Contents:
Naval usage data records in 1951-2
- Machinery operating logs
- Machinery histories
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- Failure reports
- Issue documents
- Issues for end use documents
- Data generated in special programs by other organizations, such as SDCPs

Ship's own use
- Ships with central storerooms
- Ideal vs. actual data requirements--issue
- Ideal vs. actual data requirements--DTO
- Ships without central storerooms
- Submarines
- Tenders and repair ships

Naval shipyards
Smaller shore ship repair facilities
Changes in usage data records 1952-1960
(See also PB 157 533)

SOCIAL SCIENCES

PB 159 352 $1.60

California U., Berkeley.
PATHS OF ECONOMIC GROWTH THAT ARE OPTIMAL WITH REGARD ONLY TO FINAL STATES: A "TURNPIKE THEOREM", by Roy Radner. Technical rept. no. 1 on Contract Nonr-222 (77). 6 Jan 61, 16p. 5 refs. AD-252 175.

DESCRIPTORS: *Economics, Growth, Mathematical analysis, Theory.

PB 159 299 $2.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF ST. KITTS - NEVIS (WITH A SECTION ON ANGUILLA), by Otis P. Starkey. Technical rept. no. 7 on Contract Nonr-908(13). Jan 61, 21p.

DESCRIPTORS: *Commerce, *Geography, Economic conditions, Economics, Production, Terrain, Caribbean Islands.

PB 159 241 $3.60

Princeton U., N. J.
GRADIENT CONFIGURATION AND QUADRATIC FUNCTIONS, by S. N. Afriat. Rept. on Contract Nonr-1858(16). 10 Jan 61, 36p. Econometric Research Program Research memo. no. 20; AD-251 127.

DESCRIPTORS: *Economics, Matrix algebra, Number theory

PB 159 240 $1.60

Princeton U., N. J.
A NEW LOOK AT ECONOMIC TIME SERIES ANALYSIS, by Oskar Morgenstern. Rept. on Contract Nonr-1858(16). 5 Jan 61, 20p. 21 refs Econometric Research Program Research memo. no. 19; AD-251 057.

DESCRIPTORS: *Economics, Time, Analysis, Fourier analysis, Theory, Series, Mathematical analysis, Quantitative analysis

The task of the economist is seen as eliminating the periodicites and rhythms of economic activities in order to analyze the remainder which contains the true puzzle of the behavior of the system - the remainder presumably being a random series. It is felt that it ought to be possible to discover the regularities which are demonstrably present in many basic input series. Attempts have been made over the past few decades to test the applicability of Fourier and periodogram analysis for economic time series. Present spectral analysis, firmly anchored in Fourier analysis, is still in a state of development. Spectral analysis determines a function, identified as the power spectral density function, which measures the true contribution to the total variance of the given series that is attributable to a specific frequency. If this function could be estimated, it would lead to the discovery of important economic mechanisms that underlie the particular time series. It is felt that one of the chief aims of time series analysis is to discover whether periodic fluctuations occur, where they lie, and to measure their energy. It is felt that the information obtained from time series analysis would be of little value unless it is put into an econometric model of the economy. It is pointed out, however, that while the longest series are the most desirable from the point of view of analysis, they may not yield a reasonable model sufficiently similar to reality.

MISCELLANEOUS

PB 181 069 $1.25, $10.00/year

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. Feb 62.

DESCRIPTORS: *Naval research, Scientific research, Fission products, Fission, District of Columbia, X-rays, Spectrographic analysis, Chemical analysis, Shipborne, Computers, Display systems, Satellites, Tracking, Atmosphere, Astrophysics, Chemistry, Fatty acids, Fluorination, Paints, Radiation effects, Monomolecular films, Viscosity, Water, Bibliography, Porous metals, Electrodes, Computers, Data, Reduction, X-ray diffraction analysis, Mechanics, Hypervelocity guns, Guns, Metallurgy, Ceramic materials, Iron compounds, Phosphates, Nickel, Fatigue (Mechanics), Nickel alloys, Palladium alloys, Specific heat, Hall effect, Semiconductors, Niobium alloys, Zirconium alloys, Oxidation, Radio, Atmospheric sounding, Meteorological instruments, Radar signals, Polarization, Antennas, Space flight, Signals, Analysis, Solid state physics, Antiferromagnetism, Glass, Ytterbium, Electrons, Sound, Acoustics, Hydrostatic pressure, Impedance, Transducers, Electrostatic precipitation, Inspection windows, Cleaning, Reports, Patents.

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Recent Measurements of Nuclear Fission Debris in the Washington, D. C. Area, by L. B. Lockhart, Jr.
Precision in X-Ray Spectrochemical Analysis: Fixed Time Versus Fixed Count, by L. S. Birks and D. M. Brown
Scientific program:
Applications Research: Shipboard satellite position computer and display. On thermoplastic recording, storage, and projection systems
Atmosphere and Astrophysics: Improved instrumentation for precision measurements of atmospheric electricity
Chemistry: Effect of progressive fluorination of a fatty acid on the wettability of the adsorbed, condensed monolayer. Properties of paints as affected by ultraviolet radiation in a vacuum - part 2. Surface viscosity of monomolecular films on water at low film pressures: a literature survey. Properties of stiff pastes and their use in the electrolytic preparation of porous metal electrodes. X-ray diffraction data-reduction program for the IBM 704 and 7090 computers
Mechanics: Auxiliary compression unit boosts performance of hypervelocity two-stage, light-gas gun
Metallurgy and Ceramics: Preparation of two crystalline iron II phosphates. Fatigue behavior of nickel in a nitrogen atmosphere at various pressures. Electronic specific heat of nickel-palladium alloys. Upper limit for the Hall effect in a semiconductor. Preparation of superconducting columbium-zirconium alloys. Vacuum fusion analysis of oxidation compounds
Radio: Remote temperature encoder for the Transosonde meteorological sounding system. An improved radar polarization simulator with separate "antennas" for transmitting and receiving. Optical calibration of the Navy space surveillance system. Small-signal analysis of monotrons using a circular cylindrical T_{lmn} resonator
Solid State Physics: Observations of the magnetically induced magnetoelectric effect and evidence for antiferromagnetic domains. LASER action in ytterbium-activated silicate glass. Positioning and scanning a 1-micron specimen for analysis with a 1-micron electron probe
Sound: Results of a long-term test of a potted electronic component under hydrostatic pressures up to 10,000 psig. Theory of modal impedances of transducer surfaces radiating sound into the far field
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- Distribution channels, facilities and services
- Marketing and distribution statistics

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- Development of new products
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